



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

# FINAL FLIGHT MISSION RULES



## APOLLO 17 (AS-514/114/LM-12)

(NASA-TM-X-68972) FINAL FLIGHT MISSION  
RULES. APOLLO 17 (AS-514/114/LM-12)  
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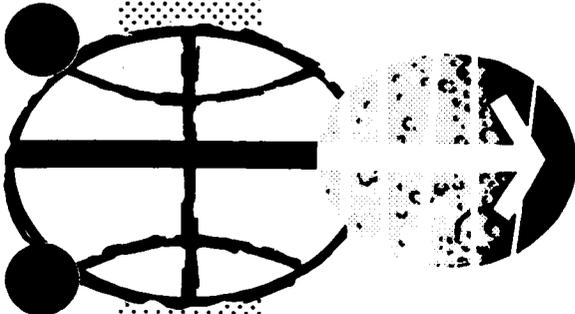
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SEPTEMBER 1, 1972

PREPARED  
FLIGHT CONTROL DIVISION

MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS

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APOLLO 17  
FINAL FLIGHT MISSION RULES

PREFACE

THIS DOCUMENT CONTAINS THE FINAL FLIGHT MISSION RULES FOR APOLLO 17 AS OF SEPTEMBER 1, 1972. ALL SUBSEQUENT REVISIONS TO THIS DOCUMENT WILL BE PRINTED ON DIFFERENT COLORED PAGES FOR EASY RECOGNITION.

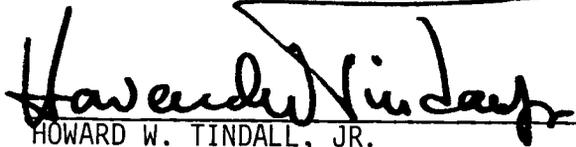
IT IS REQUESTED THAT ANY ORGANIZATION HAVING COMMENTS, QUESTIONS, OR SUGGESTIONS CONCERNING THESE MISSION RULES CONTACT MR. JOHN H. TEMPLE, FLIGHT OPERATIONS AND RECOVERY BRANCH, BUILDING 30, ROOM 2058, PHONE 713-483-4126.

ANY REQUESTS FOR ADDITIONAL COPIES OR CHANGES TO THE DISTRIBUTION LIST IN APPENDIX B OF THIS DOCUMENT MUST BE MADE IN WRITING TO MR. HOWARD W. TINDALL, JR., DIRECTOR OF FLIGHT OPERATIONS, MANNED SPACECRAFT CENTER, HOUSTON, TEXAS.

THIS IS A CONTROL DOCUMENT AND ANY CHANGES ARE SUBJECT TO THE CHANGE CONTROL PROCEDURES DELINEATED IN APPENDIX C. THIS DOCUMENT IS NOT TO BE REPRODUCED WITHOUT THE WRITTEN APPROVAL OF THE CHIEF, FLIGHT CONTROL DIVISION, MANNED SPACECRAFT CENTER, HOUSTON, TEXAS.

APPROVED BY:

CONCURRED BY:



HOWARD W. TINDALL, JR.  
DIRECTOR OF FLIGHT OPERATIONS



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MSFC FLIGHT CONTROL OFFICE



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## MISSION RULES

R	ITEM	<div style="border: 1px solid black; width: fit-content; margin: 0 auto; padding: 5px;">INTRODUCTION AND PURPOSE</div> <p style="margin-top: 20px;">MISSION RULES ARE PROCEDURAL STATEMENTS WHICH PROVIDE FLIGHT CONTROL PERSONNEL WITH GUIDELINES TO EXPEDITE THE DECISION-MAKING PROCESS. THE RULES ARE BASED ON AN ANALYSIS OF MISSION EQUIPMENT CONFIGURATION, SYSTEMS OPERATIONS AND CONSTRAINTS, FLIGHT CREW PROCEDURES, AND MISSION OBJECTIVES. THE DIRECTOR OF FLIGHT OPERATIONS, MANNED SPACECRAFT CENTER, HOUSTON, TEXAS, HAS THE OVERALL RESPONSIBILITY FOR THE PREPARATION, CONTENTS, AND CONTROL OF THE FLIGHT MISSION RULES.</p> <p style="margin-top: 20px;">MISSION RULES CAN BE CATEGORIZED AS "GENERAL" AND "SPECIFIC." GENERAL MISSION RULES CONTAIN THE BASIC PHILOSOPHIES USED IN THE DEVELOPMENT OF THE FLIGHT MISSION RULES. SPECIFIC MISSION RULES PROVIDE THE BASIC CRITERIA FROM WHICH REAL-TIME DECISIONS ARE MADE AND WILL BE FORMATTED AS FOLLOWS:</p> <ul style="list-style-type: none"> <li>A. THE "CONDITION/MALFUNCTION" COLUMN DEFINES THE FAILURE.</li> <li>B. THE "PHASE" COLUMN IDENTIFIES THE TIME INTERVAL IN WHICH THE CONDITION/MALFUNCTION OCCURS.</li> <li>C. THE "RULING" COLUMN DEFINES FLIGHT CONTROLLER ACTION AND/OR PROCEDURES THAT MUST BE ACCOMPLISHED AS A RESULT OF THE CONDITION.</li> <li>D. THE "CUES/NOTES/COMMENTS" COLUMN PROVIDES THE FLIGHT CONTROLLER WITH ADDITIONAL INFORMATION CONCERNING THE CONDITION/MALFUNCTION AND/OR THE RULING.</li> </ul>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	INTRODUCTION AND PURPOSE		1	Tape 1.2

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## MISSION RULES

### I - GENERAL GUIDELINES

R	ITEM	<div style="border: 1px solid black; padding: 10px; margin: 0 auto; width: 80%;"> <p style="text-align: center; margin: 0;"><u>OMSF GENERAL RULES</u></p> </div>					
I-1		MISSION RULES ARE EFFECTIVE DURING THE LAUNCH COUNTDOWN, FLIGHT, RECOVERY, AND DURING PRELAUNCH TESTS WHEN APPLICABLE. WHEN POST MISSION QUARANTINE IS IMPOSED, RULES WILL BE APPLICABLE UNTIL DELIVERY OF THE FLIGHT CREW, FLIGHT HARDWARE, AND LUNAR SAMPLES TO THE LUNAR RECEIVING LABORATORY.					
I-2		DURING THE CONDUCT OF THE MISSION, THE MISSION DIRECTOR WILL BE ADVISED OF ALL RECOMMENDATIONS THAT INVOLVE CHANGES TO PRIMARY OBJECTIVES, MISSION RULES, FLIGHT PLAN CONTENT, OR LAUNCH/FLIGHT SAFETY.					
I-3		WITHIN THEIR RESPECTIVE AREAS OF RESPONSIBILITY, THE SPACECRAFT COMMANDER, THE LAUNCH DIRECTOR, FLIGHT DIRECTOR, DOD MANAGER FOR MSF SUPPORT OPERATIONS, AND THE MISSION DIRECTOR MAY TAKE OR RECOMMEND ANY ACTION REQUIRED FOR OPTIMUM CONDUCT OF THE MISSION.					
I-4		THE SPACECRAFT COMMANDER, SPACECRAFT TEST CONDUCTOR, LAUNCH VEHICLE TEST CONDUCTOR, SPACE VEHICLE TEST SUPERVISOR, LAUNCH OPERATIONS MANAGER, LAUNCH DIRECTOR, FLIGHT DIRECTOR, DOD MANAGER FOR MSF SUPPORT OPERATIONS, OR THE MISSION DIRECTOR MAY REQUEST A HOLD FOR CONDITIONS WITHIN THEIR RESPECTIVE AREAS OF RESPONSIBILITY.					
I-5		DURING THE COUNTDOWN, THE LAUNCH VEHICLE AND SPACECRAFT PROGRAM MANAGERS AND RESPECTIVE CENTER OPERATIONS MANAGERS WILL PROVIDE TECHNICAL ADVICE AND SUPPORT DIRECTLY TO THE LAUNCH OPERATIONS MANAGER AND LAUNCH DIRECTOR. THE LATTER TWO WILL KEEP THE MISSION DIRECTOR FULLY INFORMED OF PROBLEMS AND PROPOSED SOLUTIONS. DURING THE FLIGHT PHASE OF OPERATIONS, SIMILAR SUPPORT AS REQUIRED WILL BE PROVIDED TO THE FLIGHT DIRECTOR AND THE MSC DIRECTOR OF FLIGHT OPERATIONS. THE MISSION DIRECTOR WILL BE KEPT FULLY INFORMED BY THESE INDIVIDUALS OF PROBLEMS AND PROPOSED SOLUTIONS DURING THE APPLICABLE PHASES OF THE MISSION.					
I-6		WHEN TIME PERMITS, THE FAILURE OF A MANDATORY OR HIGHLY DESIRABLE ITEM WILL BE REPORTED TO THE MISSION DIRECTOR BY THE LAUNCH DIRECTOR OR THE FLIGHT DIRECTOR. THE INITIAL REPORT WILL INCLUDE THE POSITION OR FACILITY THAT DETECTED THE MALFUNCTION. SUBSEQUENTLY, THE MISSION DIRECTOR WILL BE INFORMED OF ESTIMATED TIME TO REPAIR AND RECOMMENDED "PROCEED, HOLD, RECYCLE," OR "SCRUB" ACTION AS IT DEVELOPS.					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
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						Tape 1.3	

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## MISSION RULES

### I - GENERAL GUIDELINES - CONTINUED

R	ITEM															
	I-7	IF A MANDATORY ITEM FAILS DURING THE COUNTDOWN, IT WILL BE CORRECTED PRIOR TO LAUNCH, HOLDING OR RECYCLING THE COUNTDOWN AS NECESSARY. IF A MANDATORY ITEM CANNOT BE CORRECTED TO PERMIT LIFTOFF WITHIN THE LAUNCH WINDOW, THE MISSION DIRECTOR MAY PROCEED WITH THE LAUNCH AFTER APPROPRIATE COORDINATION WITH THE APPROPRIATE OPERATIONS AND PROGRAM MANAGERS. GENERALLY THE LOSS OF A MANDATORY ITEM WILL RESULT IN A SCRUB.														
	I-8	AS THE DESIGNATED REPRESENTATIVE OF THE PROGRAM DIRECTOR, ONLY THE MISSION DIRECTOR MAY SCRUB THE MISSION. FURTHER, THE MISSION DIRECTOR RETAINS THE PRIMARY AUTHORITY TO DOWNGRADE A MANDATORY CATEGORY. THIS AUTHORITY WILL BE EXERCISED AS CIRCUMSTANCES DICTATE AND AFTER APPROPRIATE RECOMMENDATIONS FROM THE DIRECTOR OF FLIGHT OPERATIONS, PROGRAM MANAGERS, LAUNCH DIRECTOR, AND FLIGHT DIRECTOR.														
	I-9	CONSIDERATION WILL BE GIVEN TO THE REPAIR OF ANY HIGHLY DESIRABLE ITEM, BUT IN NO CASE WILL THE LAUNCH BE SCRUBBED FOR ANY SINGLE HIGHLY DESIRABLE ITEM. IF TWO OR MORE HIGHLY DESIRABLE ITEMS FAIL AND/OR OTHER AGGRAVATING CIRCUMSTANCES OCCUR, THE MISSION DIRECTOR MAY SCRUB THE MISSION AFTER COORDINATION WITH THE APPROPRIATE OPERATIONS AND PROGRAM MANAGERS.														
	I-10	WHENEVER POSSIBLE, THE LAUNCH SITE AND MCC WILL VERIFY TELEMETRY READOUT DISCREPANCIES OCCURRING PRIOR TO LIFTOFF. IF THE MCC LOSES A PARAMETER BUT THE LAUNCH SITE HAS A VALID READOUT, THE MCC WILL CONTINUE ON THE LAUNCH SITE READOUT. THIS IS TRUE EXCEPT FOR THOSE MANDATORY PARAMETERS (LISTED IN THE FLIGHT MISSION RULES) UPON WHICH MISSION RULES ACTION IS TAKEN. IN THIS CASE, A HOLD MAY BE CALLED TO EVALUATE THE PROBLEM.														
	I-11	THE COUNTDOWN WILL CONTINUE, WHERE POSSIBLE, CONCURRENTLY WITH CORRECTION OF AN EXISTING PROBLEM.														
	I-12	THE LAUNCH DIRECTOR WILL BE RESPONSIBLE FOR ALL ACTIONS IN THE EVENT OF LAUNCH SITE EMERGENCIES EXCEPT FOR RECOVERY OPERATIONS OF THE FLIGHT CREW AND SPACECRAFT RESULTING FROM A PAD ABORT.														
	I-13	THE LAUNCH OPERATIONS MANAGER MAY SEND AN ABORT REQUEST FROM THE TIME THE LAUNCH ESCAPE SYSTEM IS ARMED UNTIL THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER. THE CRITERIA FOR SENDING AN ABORT REQUEST WILL BE ESTABLISHED IN THE LAUNCH MISSION RULES.														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 5%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 25%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>GENERAL GUIDELINES</td> <td>OMSF GENERAL RULES</td> <td>I-2</td> <td style="text-align: right;">Tape 1.4</td> </tr> </tbody> </table>			MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	GENERAL GUIDELINES	OMSF GENERAL RULES	I-2	Tape 1.4
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## MISSION RULES

### I - GENERAL GUIDELINES - CONTINUED

R	ITEM	DESCRIPTION
	I-14	FROM LIFTOFF TO UMBILICAL TOWER CLEARANCE, THE LAUNCH OPERATIONS MANAGER AND FLIGHT DIRECTOR WILL HAVE CONCURRENT RESPONSIBILITY FOR SENDING AN ABORT REQUEST. THE CRITERIA FOR SENDING AN ABORT REQUEST DURING THIS PERIOD WILL BE ESTABLISHED IN THE LAUNCH AND FLIGHT MISSION RULES RESPECTIVELY.
	I-15	WHERE POSSIBLE, ALL MANUAL ABORT COMMAND/REQUESTS FROM THE GROUND DURING FLIGHT WILL BE BASED ON TWO INDEPENDENT INDICATIONS OF THE FAILURE. CREW ABORT ACTION WILL NORMALLY BE BASED UPON TWO CUES.
	I-16	THE LAUNCH OPERATIONS MANAGER WILL INFORM THE MCC WHEN THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER BY STATING "CLEAR TOWER" OVER ONE OF THE LOOPS FOR KSC TO MCC.
	I-17	IN THE EVENT OF NON-CATASTROPHIC SPACE VEHICLE COLLISION WITH THE UMBILICAL TOWER OR OTHER CONTINGENCIES WHICH DO NOT REQUIRE IMMEDIATE ACTION, THE LAUNCH OPERATIONS MANAGER WILL CONTINUE TO EVALUATE THE EXTENT OF DAMAGE AND WILL PROVIDE INFORMATION TO THE FLIGHT DIRECTOR FOR ANY ACTION NECESSARY AFTER UMBILICAL TOWER CLEARANCE.
	I-18	COMPLETE GROUND CONTROL OF THE SPACE VEHICLE PASSES FROM THE LAUNCH DIRECTOR TO THE FLIGHT DIRECTOR WHEN THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER.
	I-19	IN THE MCC, THE FLIGHT DIRECTOR, FLIGHT DYNAMICS OFFICER AND BOOSTER SYSTEMS ENGINEER WILL HAVE THE CAPABILITY TO SEND AN ABORT REQUEST. THE CRITERIA FOR SENDING AN ABORT REQUEST WILL BE ESTABLISHED IN THE FLIGHT RULES.
	I-20	THE SPACECRAFT COMMANDER MAY INITIATE SUCH INFLIGHT ACTION AS HE DEEMS ESSENTIAL FOR CREW SAFETY.
	I-21	<u>FLIGHT CREW SAFETY SHALL TAKE PRECEDENCE OVER THE ACCOMPLISHMENT OF MISSION OBJECTIVES.</u>
	I-22	IN THE EVENT OF COMMUNICATIONS LOSS BETWEEN THE MANNED SPACE FLIGHT NETWORK AND THE SPACECRAFT, THE SPACECRAFT COMMANDER WILL ASSUME RESPONSIBILITY FOR MISSION CONDUCT AS DESCRIBED WITHIN THE FLIGHT MISSION RULES.
	I-23	THE FLIGHT DIRECTOR, THROUGH THE RECOVERY COORDINATOR, WILL PROVIDE THE DOD MANAGER FOR MANNED SPACE FLIGHT SUPPORT OPERATIONS THE PREDICTED LOCATION AND TIME OF SPLASHDOWN.

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## MISSION RULES

### PART I - GENERAL GUIDELINES - CONTINUED

R	ITEM						
	I-24	THE DOD MANAGER FOR MANNED SPACEFLIGHT SUPPORT OPERATIONS IS RESPONSIBLE FOR RECOVERY AND FOR COMMAND AND CONTROL OF DOD RECOVERY FORCES. RECOMMENDATIONS, GUIDELINES AND REQUIREMENTS - AS SET FORTH BY NASA - WILL BE CONSIDERED TO EFFECT SAFE AND EXPEDITIOUS RECOVERY OF THE FLIGHT CREW AND SPACECRAFT.					
	I-25	IF THE LM DESCENT STAGE WITH A NUCLEAR POWER SOURCE ABOARD IS ABANDONED WHILE SUBJECT TO EARTH RETURN AND IF CREW SAFETY AND CONTROL SYSTEMS CONSIDERATIONS PERMIT, THE LM WILL BE TARGETED FOR AN OCEAN AREA REENTRY. THE PREDICTED IMPACT LOCATION WILL BE DETERMINED AND REPORTED TO THE APOLLO MISSION DIRECTOR.					
	I-26	NO SPACE VEHICLE COMPONENT WILL BE DELIBERATELY TARGETED FOR A LUNAR IMPACT WITHOUT THE PRIOR APPROVAL OF THE APOLLO MISSION DIRECTOR.					
		<p>RULE NUMBERS I-27 THROUGH I-35 ARE RESERVED.</p>					
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## MISSION RULES

### PART I - GENERAL GUIDELINES - CONTINUED

R	ITEM															
		<u>DEFINITIONS</u>														
I-36		<u>PRIMARY OBJECTIVE</u> - A STATEMENT OF THE PRIMARY PURPOSE OF THE FLIGHT. WHEN USED IN CENTER CONTROL DOCUMENTATION, THE PRIMARY OBJECTIVE(S) MAY NOT BE MODIFIED BUT MAY BE AMPLIFIED BY DETAILED OBJECTIVES.														
I-37		<u>DETAILED OBJECTIVE</u> - A SCIENTIFIC, ENGINEERING, MEDICAL, OR OPERATIONAL INVESTIGATION THAT PROVIDES IMPORTANT DATA AND EXPERIENCE FOR USE IN DEVELOPMENT OF HARDWARE AND/OR PROCEDURES FOR APPLICATION TO APOLLO MISSIONS. CSM ORBITAL PHOTOGRAPHIC TASKS, THOUGH REVIEWED BY THE MANNED SPACE FLIGHT EXPERIMENTS BOARD, ARE NOT ASSIGNED AS FORMAL EXPERIMENTS AND WILL BE PROCESSED AS A SINGLE DETAILED OBJECTIVE.														
I-38		<u>CATEGORY</u> - A CATEGORY IS A DEGREE OF IMPORTANCE ASSIGNED TO SPACE VEHICLE AND OPERATIONAL SUPPORT ELEMENTS. SPECIFIC CATEGORIES APPLICABLE TO MISSION RULES ARE MANDATORY AND HIGHLY DESIRABLE.														
I-39		<u>MANDATORY (M)</u> - A MANDATORY ITEM IS A SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT THAT IS ESSENTIAL FOR ACCOMPLISHMENT OF THE MISSION, WHICH INCLUDES PRELAUNCH, FLIGHT, AND RECOVERY OPERATIONS THAT ENSURE CREW SAFETY AND EFFECTIVE OPERATIONAL CONTROL AS WELL AS THE ATTAINMENT OF THE PRIMARY OBJECTIVES.														
I-40		<u>HIGHLY DESIRABLE (HD)</u> - A HIGHLY DESIRABLE ITEM IS A SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT THAT SUPPORTS AND ENHANCES THE ACCOMPLISHMENT OF THE MISSION AND IS ESSENTIAL FOR THE ACCOMPLISHMENT OF THE DETAILED OBJECTIVES.														
I-41		<u>SPACE VEHICLE ELEMENT</u> - A PART OF ANY LAUNCH VEHICLE OR SPACECRAFT SYSTEM.														
I-42		<u>OPERATIONAL SUPPORT ELEMENT</u> - A PART OF ANY SYSTEM OR ACTIVITY THAT IS INVOLVED IN THE COUNTDOWN, LAUNCH, FLIGHT, OR RECOVERY OPERATIONS OTHER THAN THOSE ELEMENTS WHICH ARE A PART OF THE SPACE VEHICLE ITSELF.														
I-43		<u>REDLINE</u> - A REDLINE VALUE IS A MAXIMUM AND/OR MINIMUM LIMIT OF A CRITICAL PARAMETER NECESSARY TO IDENTIFY VEHICLE, SYSTEM, AND COMPONENT PERFORMANCE AND OPERATION. REDLINE VALUES WILL BE ESTABLISHED SUCH THAT FURTHER DEGRADATIONS OF THE SYSTEM OR COMPONENT COULD LEAD TO A FAILURE TO ACCOMPLISH THE PRIMARY OBJECTIVES.														
I-44		<u>REDLINE FUNCTION</u> - A REDLINE FUNCTION IS A PARAMETER THAT HAS BEEN IDENTIFIED TO MONITOR THE FUNCTIONING OF A UNIT TO ENSURE THAT THE OPERATIONAL PERFORMANCE OF THE UNIT IS ACCEPTABLE TO MEET THE PRIMARY OBJECTIVES. REDLINE FUNCTIONS ARE MANDATORY.														
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## MISSION RULES

### PART I - GENERAL GUIDELINES - CONTINUED

R	ITEM							
	I-45	<u>MEASUREMENT</u> - A MEASUREMENT IS A SPECIFIC DATA CHANNEL OF INSTRUMENTATION MONITORING A SINGLE FUNCTION.						
	I-46	<u>INSTRUMENTATION</u> - INSTRUMENTATION IS THE EQUIPMENT THAT ACQUIRES, TRANSMITS, AND MONITORS DATA FOR PERFORMANCE EVALUATION OF SPACE VEHICLE AND OPERATIONAL SUPPORT ITEMS.						
	I-47	<u>COUNTDOWN</u> - THE PERIOD OF TIME COMMENCING WITH START OF THE OFFICIAL COUNTDOWN CLOCK. DURING THE INTERVAL OF TIME PRIOR TO THIS PERIOD, TASK ACCOMPLISHMENT IS NOT STRICTLY TIME-RELATED AND A HOLD IS A MEANINGLESS TERM. THE OFFICIAL COUNTDOWN CLOCK STARTS AT THE BEGINNING OF LAUNCH VEHICLE BATTERY INSTALLATION.						
	I-48	<u>PROCEED</u> - CONTINUE IN ACCORDANCE WITH PRESCRIBED COUNTDOWN PROCEDURES.						
	I-49	<u>HOLD</u> - INTERRUPTION OR DELAY OF THE COUNTDOWN FOR ANY REASON SUCH AS UNFAVORABLE WEATHER, REPAIR OF HARDWARE OR CORRECTION OF CONDITIONS UNSATISFACTORY FOR LAUNCH OR FLIGHT.						
	I-50	<u>HOLD-POINT</u> - A PREDETERMINED POINT WHERE THE COUNTDOWN MAY BE CONVENIENTLY INTERRUPTED.						
	I-51	<u>SCRUB</u> - THE LAUNCH IS TERMINATED TO BE RESCHEDULED.						
	I-52	<u>RECYCLE</u> - THE COUNTDOWN IS STOPPED AND RETURNED TO A DESIGNATED POINT OR AS SPECIFIED IN THE LAUNCH MISSION RULES.						
	I-53	<u>TURNAROUND TIME</u> - TURNAROUND TIME IS THE TOTAL TIME REQUIRED FROM A SCRUB TO THE NEXT SCHEDULED LIFTOFF TIME (T-0) INCLUDING RECYCLE AND COUNTDOWN.						
	I-54	<u>CUTOFF</u> - THE AUTOMATIC OR MANUAL COMMAND TO STOP THE LAUNCH SEQUENCE AFTER INITIATION OF THE AUTOMATIC LAUNCH SEQUENCE.						
	I-55	<u>LIFTOFF</u> - THE EVENT DETERMINED BY THE INSTRUMENTATION UNIT UMBILICAL DISCONNECT SIGNAL. IT IS THAT POINT IN TIME WHEN PLUS TIME COMMENCES.						
			MISSION	REV	DATE	SECTION	GROUP	PAGE
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								Tape 2.2

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## MISSION RULES

### PART I - GENERAL GUIDELINES - CONCLUDED

R	ITEM							
	I-56	<u>ABORT</u> - MISSION TERMINATION BY UNSCHEDULED INTENTIONAL SEPARATION OF THE SPACECRAFT FROM THE LAUNCH VEHICLE PRIOR TO ORBITAL INSERTION.						
	I-57	<u>EARLY MISSION TERMINATION</u> - UNSCHEDULED INTENTIONAL MISSION TERMINATION AT OR AFTER ORBITAL INSERTION.						
	I-58	<u>MISSION PERIOD TERMINATION (LUNAR LANDING MISSION)</u> - MISSION PERIOD TERMINATION OCCURS UPON THE RELEASE OF THE FLIGHT CREW, FLIGHT HARDWARE, OR RELEASE OF THE LUNAR SAMPLES TO APPROVED PRINCIPLE INVESTIGATORS, WHICHEVER OCCURS LATER.						
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## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S

R	ITEM							
		<u>GENERAL</u>						
1-1		THE FLIGHT MISSION RULES OUTLINE PREPLANNED DECISIONS DESIGNED TO MINIMIZE THE AMOUNT OF REAL-TIME RATIONALIZATION REQUIRED WHEN NON-NOMINAL SITUATIONS OCCUR DURING THE TERMINAL COUNTDOWN, THE FLIGHT PHASE, AND RECOVERY OPERATIONS.						
1-2		WHENEVER POSSIBLE, THE CREW AND GROUND WILL VERIFY ALL MALFUNCTIONS. WHENEVER THERE IS A CONFLICT BETWEEN SPACECRAFT AND GROUND TELEMETRY READOUTS, THE SPACECRAFT READOUTS ARE PRIME (ASSUMING THE SPACECRAFT HAS ADEQUATE INSTRUMENTATION AND THAT APPLICABLE SPACECRAFT COCKPIT READOUTS ARE OPERATIONAL).						
1-3		SPACECRAFT LAUNCH WILL NOT BE ATTEMPTED IF KNOWN SPACECRAFT SYSTEMS MALFUNCTIONS WILL LIMIT THE MISSION DURATION SUCH THAT ACCOMPLISHMENT OF THE PRIMARY DETAILED OBJECTIVES WILL BE COMPROMISED.						
1-4		WHEN A CONFLICT OF FLIGHT PLAN ACTIVITIES OCCURS, THE FLIGHT DIRECTOR WILL DETERMINE THE PRIORITY OF ACTIVITIES.						
1-5		IN SOME INSTANCES THE SPECIFIC MISSION RULES MAY DEVIATE FROM THE GENERAL GUIDELINES CONTAINED IN PART I OR FROM THESE GENERAL RULES. THE SPECIFIC MISSION RULE WILL APPLY IN ALL CASES, AND THE DEVIATIONS FROM THE GENERAL GUIDELINES WILL BE NOTED.						
1-6		THE FLIGHT DIRECTOR MAY, AFTER ANALYSIS OF THE FLIGHT, CHOOSE TO TAKE ANY NECESSARY ACTION REQUIRED FOR THE SUCCESSFUL COMPLETION OF THE MISSION.						
1-7		MISSION RULE LIMITS THAT ARE CONSIDERED TO BE INTERIM OR UNCONFIRMED NUMBERS WILL BE UNDERLINED IN THIS PUBLICATION AND IN ALL SUBSEQUENT REVISIONS UNTIL THE NUMBERS ARE CONFIRMED BY THE RESPONSIBLE NASA AGENCY.						
1-8		THE SYSTEMS LIMITS LISTED IN THESE RULES ARE THE ACTUAL VEHICLE LIMITS AS WELL AS THEY ARE KNOWN AND UNDERSTOOD AND ARE NOT BIASED TO COMPENSATE FOR TIME DELAYS OR INSTRUMENTATION ERRORS WITHIN THE SPACECRAFT AND MSFN DATA/DISPLAY SYSTEMS.						
1-9		UNLESS STATED OTHERWISE, MANDATORY AND HIGHLY DESIRABLE INSTRUMENTATION REQUIREMENTS ARE SATISFIED BY EITHER ONBOARD OR PCM CAPABILITY.						
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## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S - CONTINUED

R	ITEM						
	1-10	<p>MANDATORY SPACE VEHICLE INSTRUMENTATION FOR THE PURPOSES OF FLIGHT MISSION RULES MUST BE IN ACCORD WITH THE FOLLOWING CRITERIA (REFERENCE OMSF GENERAL RULE I-39):</p> <ul style="list-style-type: none"> <li>A. REQUIRED TO INSURE FLIGHT CREW SAFETY</li> <li>B. REQUIRED TO IMPLEMENT RULES RESULTING IN LAUNCH ABORTS</li> <li>C. REQUIRED TO IMPLEMENT RULES RESULTING IN EARLY MISSION TERMINATION</li> <li>D. REQUIRED TO MAKE DECISION TO CONTINUE TO THE NEXT MISSION PHASE</li> </ul> <p>USING THE ABOVE CRITERIA, THE MANDATORY INSTRUMENTATION LISTINGS IN THIS DOCUMENT WILL BE CROSS-REFERENCED TO THE APPROPRIATE MISSION RULE.</p>					
	1-11	<p>THE CRITERION FOR CATEGORIZING INSTRUMENTATION AS HIGHLY DESIRABLE IN THE FLIGHT MISSION RULES IS ANY INSTRUMENTATION REQUIRED FOR NORMAL SYSTEMS MANAGEMENT OR REQUIRED FOR FLIGHT CONTROL DECISIONS NOT IN THE MANDATORY CATEGORY.</p>					
	1-12	<p>RF COMMANDS WILL NOT BE TRANSMITTED TO THE SPACECRAFT OR LAUNCH VEHICLE DURING THE LAUNCH PHASE UNLESS SPECIFIC MISSION RULES ARE INVOKED WHICH REQUIRE COMMAND ACTIVITY.</p>					
	1-13	<p>THE LAUNCH OPERATIONS MANAGER WILL INFORM THE FLIGHT DIRECTOR WHEN THE SPACE VEHICLE HAS CLEARED THE UMBILICAL TOWER BY STATING "CLEAR TOWER" OVER CHANNEL 111.</p>					
	1-14	<p>THE COMMAND PILOT MAY INITIATE SUCH INFLIGHT ACTION AS HE DEEMS ESSENTIAL FOR CREW SAFETY.</p>					
	1-15	<p>IN THE EVENT OF LOSS OF COMMUNICATIONS BETWEEN THE MSFN AND THE S/C, THE COMMAND PILOT WILL ASSUME RESPONSIBILITY OF MISSION DIRECTION WITHIN THE FRAMEWORK OF THE MISSION RULES.</p> <p>RULE NUMBERS 1-16 THROUGH 1-23 ARE RESERVED.</p>					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	GENERAL	1-2
							Tape 50.1



# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S - CONTINUED

R	ITEM	DESCRIPTION														
	1-33	<u>CONTINGENCY ORBIT INSERTION (COI)</u> - AN SPS PROPULSIVE MANEUVER WHICH WILL PROVIDE CSM INSERTION INTO A SAFE ORBIT ( $H_p \geq 70$ NM) IN THE EVENT OF AN SLV FAILURE OCCURRING IMMEDIATELY PRIOR TO INSERTION, OR IN THE EVENT OF DEGRADED SLV PERFORMANCE.														
	1-34	<u>S-IVB DESTRUCT PACKAGE SAFING</u> - THE EMERGENCY DESTRUCT PACKAGE IS SAFED BY THE RSO TRANSMITTING A COMMAND WHICH PERMANENTLY REMOVES POWER FROM THE RANGE SAFETY RECEIVERS.														
	1-35	<u>S-IVB SAFING</u> - A PASSIVATION SEQUENCE IN WHICH S-IVB LOX, LH <sub>2</sub> , AND HIGH PRESSURE SPHERES ARE DEPLETED.														
	1-36	<u>PRELAUNCH PHASE (PRELN)</u> - THE TIME INTERVAL FROM THE COMPLETION OF THE FLIGHT READINESS REVIEW TO LIFTOFF.														
	1-37	<p><u>FLIGHT PHASE</u> - THE INTERVAL FROM LIFTOFF THROUGH SPLASHDOWN. FOR MISSION RULE PURPOSES THE FLIGHT PHASE IS FURTHER SUBDIVIDED AS SHOWN BELOW:</p> <ul style="list-style-type: none"> <li>A. <u>LAUNCH PHASE</u> - FROM LIFTOFF THROUGH INSERTION (TB1 THROUGH TB4)</li> <li>B. <u>EARTH ORBIT PHASE</u> - FROM INSERTION THROUGH S-IVB CUTOFF FOR TRANSLUNAR INJECTION (TLI)</li> <li>C. <u>TD&amp;E PHASE</u> - FROM CSM/S-IVB SEPARATION THROUGH LM EJECTION FROM SLA</li> <li>D. <u>TRANSLUNAR COAST PHASE</u> - FROM S-IVB CUTOFF FOR TLI THROUGH LOI 1 CUTOFF</li> <li>E. <u>DOCKED PHASE</u> - THE TIME INTERVALS DURING WHICH THE LM AND CSM ARE DOCKED</li> <li>F. <u>LUNAR ORBIT PHASE</u> - FROM LOI CUTOFF TO UNDOCKING AND FROM REDOCKING TO TEI CUTOFF</li> <li>G. <u>UNDOCKED PHASE</u> - FROM UNDOCKING TO CSM CIRCULARIZATION</li> <li>H. <u>PRE-PDI PHASE</u> - FROM CIRCULARIZATION TO PDI</li> <li>I. <u>POWERED DESCENT</u> - THE TIME INTERVAL FROM THE INITIATION OF THE PDI MANEUVER TO TOUCHDOWN                             <ul style="list-style-type: none"> <li>1. <u>PDI TO PDI + 6:10</u> - DURING THIS TIME PERIOD, THE LM CAN ABORT THE POWERED DESCENT AND GET INTO ORBIT USING THE DPS ONLY AND RETAIN THE DESCENT STAGE AFTER INSERTION.</li> <li>2. <u>PDI + 6:10 TO HIGH GATE</u> - THIS PERIOD ENDS WHEN THE MANEUVER IS MADE TO VISUALLY ACQUIRE THE LANDING STIE.</li> <li>3. <u>HIGH GATE TO TOUCHDOWN</u> - LANDING SITE VISABILITY TO TOUCHDOWN.</li> </ul> </li> <li>J. <u>LUNAR STAY PHASE</u> - THE TIME INTERVAL FROM TOUCHDOWN UNTIL LIFTOFF</li> <li>K. <u>EVA</u> - THE TIME INTERVAL FROM LM DEPRESSURIZATION (3.5 PSIA AND DECREASING) UNTIL LM REPRESSURIZATION (3.5 PSIA AND INCREASING)</li> <li>L. <u>ASCENT PHASE</u> - THE TIME INTERVAL FROM LIFTOFF TO LM INSERTION INTO LUNAR ORBIT</li> <li>M. <u>RENDEZVOUS</u> - THE TIME INTERVAL FROM INSERTION INTO LUNAR ORBIT AFTER ASCENT OR AFTER AN ABORTED DESCENT UNTIL CSM/LM DOCKING</li> <li>N. <u>TRANSEARTH COAST PHASE</u> - FROM TEI CUTOFF TO CM/SM SEPARATION</li> <li>O. <u>ENTRY PHASE</u> - FROM CM/SM SEPARATION TO SPLASHDOWN</li> </ul>														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>GENERAL RULES AND SOP'S</td> <td>DEFINITIONS</td> <td>1-4</td> <td style="text-align: right;">Tape 3.4</td> </tr> </tbody> </table>			MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	DEFINITIONS	1-4	Tape 3.4
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# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S - CONTINUED

R	ITEM	DESCRIPTION														
	1-38	<u>RECOVERY PHASE</u> - THE TIME INTERVAL FROM SPLASHDOWN TO DELIVERY OF THE FLIGHT CREW AND SPACECRAFT TO DESIGNATED LAND BASED INSTALLATIONS.														
	1-39	<p>REENTRY DEFINITIONS:</p> <p>A. <u>AUTOMATIC</u> - REENTRY CONTROLLED BY CMC WHICH OUTPUTS BANK ANGLE COMMAND TO THE RCS.</p> <p>B. <u>CLOSED LOOP</u> - REENTRY CONTROLLED BY THE CREW MANUALLY FLYING BANK ANGLE MODULATION USING CMC ENTRY PROGRAM OUTPUTS.</p> <p>C. <u>OPEN LOOP REENTRY</u> - REENTRY CONTROLLED BY THE CREW USING SPACECRAFT DISPLAYS AND FLYING:</p> <ol style="list-style-type: none"> <li>1. BANK ANGLE (RR 0-90) AND RETRB (RL 0-90).</li> <li>2. CONSTANT BANK ANGLE - CREW ESTABLISHES AND MAINTAINS A CONSTANT BANK ANGLE. (CONSTANT BANK ANGLES GREATER THAN 90 DEGREES WILL NOT BE FLOWN EXCEPT WHEN SKIP-OUT RULE IS VIOLATED.)</li> <li>3. ROLLING REENTRY - MAINTAIN CONSTANT 18 DEGREES PER SECOND ROLL RATE.</li> <li>4. EMS RANGING - CONSTANT BANK ANGLE IS HELD TO 1G. THEN THE RANGE-TO-GO DISPLAY AND THE RANGE POTENTIAL LINES ARE COMPARED TO MODULATE THE BANK ANGLE. AT RETRB, THE PRESENT BANK ANGLE IS REVERSED.</li> </ol> <p>D. <u>CONSTANT G ENTRY</u> - CREW CONTROLS THE BANK ANGLE TO MAINTAIN A SPECIFIED G LEVEL.</p> <p>E. <u>EMS REENTRY</u> - CREW CONTROLS THE BANK ANGLE TO MAINTAIN A CONSTANT G UNTIL VELOCITY LESS THAN 25,500 FPS. THE EMS IS THEN USED TO CONTROL RANGE BY NULLING THE DIFFERENCE BETWEEN THE RANGE-TO-GO COUNTER AND THE RANGE POTENTIAL GUIDELINES. ALL MANEUVERS ARE OVERRIDDEN AS NECESSARY TO PREVENT AN ONSET OR OFFSET VIOLATION.</p>														
	1-40	<u>OPERATIONAL FOOTPRINT</u> - THE AREA THAT IS OPERATIONALLY ACCESSIBLE USING THE G&N, EMS, AND CONSTANT 4G ENTRY MODES AND ALLOWING FOR THEIR ASSOCIATED DISPERSIONS. THE G&N PORTION IS AN AREA $\pm 70$ NM TO EITHER SIDE OF THE GROUND TRACK AND EXTENDING FROM 915 NM FROM EI TO 2000 NM FROM EI. THE EMS AREA IS THE AREA FROM 61 NM UP RANGE TO 91 NM DOWN RANGE AND $\pm 52$ NM IN CROSS RANGE ABOUT THE CONSTANT 4G TARGET POINTS. THE CONSTANT 4G AREA IS THE AREA 110 NM UP RANGE TO 140 NM DOWN RANGE AND $\pm 27$ NM CROSS RANGE ABOUT THE CONSTANT 4G TARGET POINTS.														
	1-41	<u>ALTERNATE MISSION</u> - ANY DEVIATION FROM THE NOMINAL MISSION TIMELINE WHERE FURTHER MISSION OBJECTIVES ARE CONSIDERED BEFORE THE END OF THE MISSION.														
	1-42	<u>CONTINUE MISSION</u> - THE CONTINUE MISSION RULING FOR MALFUNCTIONS INDICATES THAT THE MISSION WILL BE CONTINUED IN ACCORDANCE WITH PRESENT PLANS UNLESS OVERRIDING FACTORS ARE PRESENT WHICH WOULD CAUSE SELECTION OF AN ALTERNATE CHOICE.														
	1-43	<p><u>EVASIVE MANEUVER</u> - USE OF RESIDUAL S-IVB PROPELLANTS TO ACHIEVE THE FOLLOWING IN ORDER OF PRIORITY:</p> <ol style="list-style-type: none"> <li>1. A REDUCTION IN THE PROBABILITY OF S-IVB AND SPACECRAFT RECONTACT</li> <li>2. A REDUCTION IN THE PROBABILITY OF S-IVB EARTH IMPACT</li> <li>3. AN INCREASE IN THE PROBABILITY OF S-IVB LUNAR IMPACT</li> </ol>														
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# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S - CONTINUED

R	ITEM						
	1-44	LUNAR ABORT MODES AFTER EARLY LOI SHUTOFF (REFERENCE RULE 5-61 FOR ABORT MANEUVER DEFINITION) DPS:					
		A. MODE I - 0 TO 613 FPS (IGN TO 1 + 31)					
		B. MODE II - 613 TO 1200 FPS (1 + 31 TO 2:54)					
		C. MODE III - 1200 TO 2980 (2 + 54 TO C/O)					
	1-45	SATURN L/V TIME BASES					
		<u>TIME BASE</u>	<u>DEFINITION</u>	<u>NOMINAL INITIATE TIME</u>			
		TB1	LIFTOFF TO S-IC INBOARD ENGINE CUTOFF	0:00			
		TB2	S-IC INBOARD ENGINE CUTOFF TO S-IC OUTBOARD ENGINE CUTOFF (S-IC/S-II STAGING)	2:17			
		TB3	S-IC OUTBOARD ENGINES CUTOFF TO S-II CUTOFF (S-II/S-IVB STAGING)	2:40			
		TB4	S-II CUTOFF TO S-IVB FIRST BURN CUTOFF	9:17			
		TB5	S-IVB FIRST BURN CUTOFF TO S-IVB RESTART PREPARATIONS (RESTART MINUS 9 MIN 38 SEC)	11:46			
		TB6	S-IVB RESTART MINUS 9 MIN 38 SEC TO S-IVB SECOND BURN CUTOFF	2:20:48			
		TB7	S-IVB SECOND CUTOFF TO START OF S-IVB EVASIVE MANEUVER BURN	2:36:22			
		TB8	START EVASIVE BURN TO END OF S-IVB/IC LIFETIME.	4:14:22 (BY GROUND CMD)			
		RULE NUMBERS 1-45 THROUGH 1-47 ARE RESERVED.					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	DEFINITIONS	1-6
							Tape 55.1

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S - CONTINUED

R	ITEM	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 80%;"> <p style="text-align: center; margin: 0;"><u>CRITERIA FOR TARGET POINT SELECTION</u></p> </div>																									
1-48	<p>THE CRITERIA LISTED BELOW WILL BE USED WHEN CHOOSING BETWEEN TWO OR MORE TARGET POINTS. THE CRITICALITY OF THE MISSION SITUATION WILL AFFECT THE APPLICATION OF THESE CRITERIA.</p> <table style="width: 100%; margin-top: 20px;"> <thead> <tr> <th style="width: 80%;"></th> <th style="text-align: right; width: 20%;"><u>PRIORITY</u></th> </tr> </thead> <tbody> <tr> <td>ACCEPTABLE LAND MASS CLEARANCE</td> <td style="text-align: right;">1</td> </tr> <tr> <td>ACCEPTABLE WEATHER CONDITIONS FOR RECOVERY OPERATIONS AND CM STRUCTURAL INTEGRITY</td> <td style="text-align: right;">2</td> </tr> <tr> <td>CAPABILITY OF RECOVERY FORCES</td> <td style="text-align: right;">3</td> </tr> <tr> <td>COMMUNICATION WITH THE SPACECRAFT FROM A GROUND STATION AT LEAST 40 MINUTES PRIOR TO DEORBIT BURN*</td> <td style="text-align: right;">4</td> </tr> <tr> <td>SUFFICIENT DAYLIGHT FOR RECOVERY OPERATIONS</td> <td style="text-align: right;">5</td> </tr> <tr> <td>A GROUND STATION FOR POST-DEORBIT BURN* TRACKING</td> <td style="text-align: right;">6</td> </tr> <tr> <td>VOICE CONTACT PRIOR TO AND DURING DEORBIT BURN*</td> <td style="text-align: right;">7</td> </tr> <tr> <td>POST-BLACKOUT TRACKING DATA AVAILABLE FOR REENTRY (ASSUMES PRE-BLACKOUT ACQUISITIONS)</td> <td style="text-align: right;">8</td> </tr> <tr> <td>GROUND STATIONS AVAILABLE TO OBTAIN <math>\Delta V_C</math> READOUTS AND TO PASS CREW BACKUP GUIDANCE QUANTITIES</td> <td style="text-align: right;">9</td> </tr> </tbody> </table> <p style="margin-top: 10px; text-align: center;">*OR FINAL MCC MANEUVER</p>		<u>PRIORITY</u>	ACCEPTABLE LAND MASS CLEARANCE	1	ACCEPTABLE WEATHER CONDITIONS FOR RECOVERY OPERATIONS AND CM STRUCTURAL INTEGRITY	2	CAPABILITY OF RECOVERY FORCES	3	COMMUNICATION WITH THE SPACECRAFT FROM A GROUND STATION AT LEAST 40 MINUTES PRIOR TO DEORBIT BURN*	4	SUFFICIENT DAYLIGHT FOR RECOVERY OPERATIONS	5	A GROUND STATION FOR POST-DEORBIT BURN* TRACKING	6	VOICE CONTACT PRIOR TO AND DURING DEORBIT BURN*	7	POST-BLACKOUT TRACKING DATA AVAILABLE FOR REENTRY (ASSUMES PRE-BLACKOUT ACQUISITIONS)	8	GROUND STATIONS AVAILABLE TO OBTAIN $\Delta V_C$ READOUTS AND TO PASS CREW BACKUP GUIDANCE QUANTITIES	9						
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1-49	<p>LUNAR RETURN ENTRY RANGE PRIORITY - THE RELATIVE ENTRY RANGE AT A -6.5 DEG FLIGHTPATH ANGLE (400,000 FEET TO SPLASH) PRIORITY IS AS FOLLOWS:</p> <ul style="list-style-type: none"> <li>A. 1070-1215 NM (NOMINAL)</li> <li>B. 1455-1565 NM (USED TO AVOID WEATHER VIOLATIONS IN PRIORITY A.)</li> <li>C. 1800-2500 NM (USED TO AVOID EXTREME WEATHER VIOLATIONS IN PRIORITES A AND B.)</li> </ul> <p style="margin-top: 20px;">RULE NUMBERS 1-50 THROUGH 1-55 ARE RESERVED.</p>																										
		MISSION	REV	DATE	SECTION	GROUP	PAGE																				
		APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	TARGET POINT SEL. CRITERIA	1-7	Tape 4.1																			



# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S - CONTINUED

R	ITEM							
		<u>LAUNCH ABORTS</u>						
1-66		ABORT REQUEST COMMANDS ARE COMMANDS TRANSMITTED FROM THE MCC OR LCC WHICH ILLUMINATE THE ABORT REQUEST LIGHT ON THE COMMAND PILOT'S PANEL. THE "ABORT LIGHT" AND A VOICE REPORT "ABORT" OVER A/G ARE CONSIDERED TWO CUES FOR THE CREW TO TAKE THE NECESSARY ACTION TO ABORT THE MISSION. THE GROUND WILL USE TWO INDEPENDENT CUES PRIOR TO TRANSMITTING "ABORT REQUEST." ADDITIONAL CUES FOR THE CREW WILL COME FROM ONBOARD INDICATIONS.						
1-67		ABORT ACTION CAN BE INITIATED ONLY BY THE CREW OR THE EDS.						
1-68		WHENEVER POSSIBLE, ALL ABORTS AND EARLY MISSION TERMINATIONS WILL BE TIMED FOR A WATER LANDING.						
1-69		THE FLIGHT DIRECTOR WILL INITIATE THE ABORT REQUEST FOR SPACECRAFT SYSTEM MALFUNCTIONS.						
1-70		THE FLIGHT DYNAMICS OFFICER WILL INITIATE THE ABORT REQUEST COMMAND DURING THE FLIGHT PHASE IF THE SPACE VEHICLE EXCEEDS THE FLIGHT DYNAMICS ENVELOPE.						
1-71		THE BOOSTER SYSTEMS ENGINEER WILL INITIATE THE ABORT REQUEST COMMAND BASED UPON LAUNCH VEHICLE TIME-CRITICAL SYSTEMS MALFUNCTIONS THAT WOULD NOT ALLOW A SAFE INSERTION OR CONTINUATION TO A FLIGHT DYNAMICS LIMIT LINE.						
1-72		<p>THE ONLY KSC POSITION THAT WILL HAVE ABORT REQUEST CAPABILITY IS THE LAUNCH OPERATIONS MANAGER. THE LAUNCH OPERATIONS MANAGER MAY SEND AN ABORT REQUEST FROM THE TIME THE LAUNCH ESCAPE SYSTEM IS ARMED UNTIL THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER. PRIOR TO TRANSFER OF CONTROL TO THE FLIGHT DIRECTOR, THE LAUNCH OPERATIONS MANAGER WILL INITIATE THE ABORT REQUEST COMMAND FROM KSC BASED ON THE CRITERIA DEFINED IN THE LMRD. THESE INCLUDE:</p> <p>A. MAJOR STRUCTURAL FAILURE OR EXPLOSION            B. NEGATIVE VERTICAL MOTION            C. UNCONTROLLABLE VEHICLE TILTING            D. CATASTROPHIC FIRES PRIOR TO LIFTOFF</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	LAUNCH RULES	1-9	Tape 4.3

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S - CONTINUED

R	ITEM																										
	1-73	<p>THE RSO CAN SHUT DOWN THE SLV BY TRANSMITTING THE MFCO COMMAND WHICH ALSO LIGHTS THE ABORT REQUEST LIGHT IN THE SPACECRAFT. THE MFCO WILL INITIATE AN AUTO-ABORT IF TRANSMITTED PRIOR TO EDS DISABLE. THE MFCO COMMAND INITIATES A 4.1-SEC TIMER ON THE GROUND (CAPE RSO CONSOLE ONLY), WHICH IN TURN ENABLES DESTRUCT CAPABILITY IF TRANSMITTED. THE BRSO INSERTS A TIME DELAY MANUALLY. THE RSO DESTRUCT COMMAND CAN THEN DESTROY THE SLV. THE RSO WILL ALWAYS SAFE THE S-IVB AFTER TRANSMITTING MFCO UPON VERIFICATION OF CUTOFF IF THE DESTRUCT COMMAND IS NOT TO BE TRANSMITTED.</p>																									
	1-74	<p>THE RSO WILL SAFE THE S-IVB DESTRUCT SYSTEM AFTER CONFIRMATION OF S-IVB C/O FROM THE FLIGHT DYNAMICS OFFICER. IF COMMUNICATIONS ARE LOST WITH THE FIDO, THE S-IVB DESTRUCT SYSTEM WILL BE SAFED, BASED ON THE RSO'S VERIFICATION OF S-IVB CUTOFF. ONCE SAFED, THE S-IVB DESTRUCT SYSTEM CANNOT BE REINITIATED. IF THE RSO INITIATES MFCO, THE RSO WILL INITIATE SAFING AFTER VERIFICATION OF S-IVB CUTOFF.</p>																									
	1-75	<p>EMERGENCY ENGINE SHUTDOWN METHODS:</p> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 25%;"><u>INITIATOR</u></th> <th style="width: 25%;"><u>METHOD</u></th> <th style="width: 25%;"><u>STAGE</u></th> <th style="width: 25%;"><u>TIME FRAME</u></th> </tr> </thead> <tbody> <tr> <td>ASTRONAUT</td> <td>CCW ON THC</td> <td>S-IC, S-II, S-IVB</td> <td>T+30 SEC TO S-IVB CUTOFF</td> </tr> <tr> <td>ASTRONAUT</td> <td>S-II/ S-IVB L/V STAGE SWITCH</td> <td>S-II, S-IVB</td> <td>T+2:43 TO S-IVB CUTOFF</td> </tr> <tr> <td>RSO</td> <td>RF CMD (MFCO)</td> <td>S-IC, S-II, S-IVB</td> <td>T-0 TO S-IVB CUTOFF</td> </tr> <tr> <td>EDS</td> <td>2 OF 3 VOTING LOGIC</td> <td>S-IC</td> <td>T+30 SEC TO EDS AUTO OFF AT T+2:00 MIN</td> </tr> </tbody> </table> <p style="margin-top: 20px;"><u>NOTE:</u> EDS WILL INITIATE ABORT FROM T-0 TO T+30 SEC. HOWEVER, S-IC ENGINES WILL NOT BE SHUT DOWN.</p>						<u>INITIATOR</u>	<u>METHOD</u>	<u>STAGE</u>	<u>TIME FRAME</u>	ASTRONAUT	CCW ON THC	S-IC, S-II, S-IVB	T+30 SEC TO S-IVB CUTOFF	ASTRONAUT	S-II/ S-IVB L/V STAGE SWITCH	S-II, S-IVB	T+2:43 TO S-IVB CUTOFF	RSO	RF CMD (MFCO)	S-IC, S-II, S-IVB	T-0 TO S-IVB CUTOFF	EDS	2 OF 3 VOTING LOGIC	S-IC	T+30 SEC TO EDS AUTO OFF AT T+2:00 MIN
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	1-76	<p>THE AUTOMATIC EDS (TWO ENGINE OUT AND OVERRATE AUTO-ABORT CAPABILITIES) WILL BE FLOWN CLOSED LOOP UNTIL T+02:00. DURING LAUNCH, MALFUNCTIONS AFFECTING EDS OPERATION WILL BE MANAGED AS FOLLOWS:</p> <p style="margin-top: 20px;">THE EDS AUTO SWITCH WILL BE TURNED OFF WHENEVER ANY TWO CSM ENTRY BATTERIES ARE TIED TO THE SAME MAIN BUS OR FOR CONFIRMED LOSS OF ANY CSM ENTRY BATTERY.</p>																									
		MISSION	REV	DATE	SECTION	GROUP	PAGE																				
		APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	LAUNCH RULES	1-10	Tape 4.4																			





# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 1 - GENERAL RULES AND SOP'S - CONTINUED

R	ITEM													
		<u>CREW ABORT LIMITS</u>												
1-87	<u>MAX Q REGION</u>	<p>(00:50 TO 02:00) AOA GREATER THAN OR EQUAL TO 100 PCT AND ROLL, PITCH, OR YAW ERROR GREATER THAN OR EQUAL TO 5 DEGREES (NOT APPLICABLE TO ANY ENGINE OUT PRIOR TO 50 SEC)</p> <p style="text-align: right;"><u>PROCEDURES</u></p> <p style="text-align: right;">ABORT MODE I (ACTION ONLY AFTER BOTH HAVE REACHED THRESHOLD)</p>												
1-88	<u>RATES AND ATTITUDE</u>	<p style="text-align: right;"><u>PROCEDURES</u></p> <p>A. PITCH AND YAW</p> <p style="margin-left: 40px;">1. L/O TO 2 MIN - 4 DEG/SEC 2. 2 MIN TO S-IVB CUTOFF - 10 DEG/SEC 3. YAW DEVIATION GREATER THAN 20 DEG (S-II AND S-IVB BURN ONLY) (WITH ALL ENGINES OPERATING)</p> <p style="margin-left: 40px;">ABORT MODE I, MODE II, MODE III, OR MODE IV</p> <p>B. ROLL</p> <p style="margin-left: 40px;">L/O TO S-IVB CUTOFF - 20 DEG/SEC</p> <p style="margin-left: 40px;">ABORT MODE I, MODE II, MODE III, OR MODE IV</p>												
1-89	<u>EDS AUTOMATIC ABORT LIMITS</u> (UNTIL MANUAL DEACTIVATION OF TWO ENGINES OUT AUTO AND LV RATES AT 2:00 MIN)	<p style="text-align: center;"><u>BOUNDARY OF APPLICATION</u></p> <p>A. RATES</p> <p style="margin-left: 40px;">PITCH AND YAW      4.0 ± 0.5 DEG/SEC ROLL                    20.0 ± 0.5 DEG/SEC</p> <p>B. ANY TWO ENGINES OUT</p> <p>C. CM TO IU BREAKUP</p>												
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>MISSION</th> <th>REV</th> <th>DATE</th> <th>SECTION</th> <th>GROUP</th> <th>PAGE</th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>GENERAL RULES AND SOP'S</td> <td>CREW ABORT LIMITS</td> <td>1-13</td> </tr> </tbody> </table> <p style="text-align: right;">Tape 5.2</p>	MISSION	REV	DATE	SECTION	GROUP	PAGE	APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	CREW ABORT LIMITS	1-13
MISSION	REV	DATE	SECTION	GROUP	PAGE									
APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	CREW ABORT LIMITS	1-13									

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MISSION RULES

SECTION 1 - GENERAL RULES AND SOP'S - CONCLUDED

R	ITEM						
	1-90	<p><u>S-IVB TANK PRESSURE LIMITS</u></p> <p>A. BULKHEAD ΔP (FIRST S-IVB C/O TO S/C L/V SEP)</p> <p>FUEL GREATER THAN OXID = 26 PSID            OXID GREATER THAN FUEL = 36 PSID</p> <p>B. LOX TANK PRESS GREATER THAN OR EQUAL TO 50 PSIA (L/O TO S/C L/V SEP)</p>					
	1-91	<p><u>ENGINE FAILURES</u></p> <p>LOSS OF THREE OR MORE S-II ENGINES            PRIOR TO S-IVB TO COI CAPABILITY</p> <p><u>PROCEDURES</u></p> <p>ABORT MODE I OR MODE II</p>					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	GENERAL RULES AND SOP'S	CREW ABORT LIMITS	1-14

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES

R	ITEM	GENERAL						
	2-1	<p><u>PRELAUNCH</u></p> <p>A. LAUNCH AZIMUTH LIMITATIONS RESTRICT LAUNCHES TO OCCUR BETWEEN 72 DEGREES AND 100 DEGREES.</p> <p>B. THE FLIGHT DIRECTOR WILL EVALUATE WIND SIMULATIONS ALONG THE MODE I (TOWER) ABORT TRACK PRIOR TO THE START OF CRITICAL COUNTDOWN ACTIVITIES AND WILL ADVISE THE LAUNCH DIRECTOR OF ANY PREDICTED PERIODS OF LAND LANDING. IF THE FLIGHT DIRECTOR IS UNABLE TO PROVIDE THIS EVALUATION, A LAND LANDING WILL BE ASSUMED AND THE SPACECRAFT WIND CONSTRAINTS FOR LAND IP'S WILL BE APPLIED. THESE CONSTRAINTS REQUIRE THAT THE SPACECRAFT NOT BE LAUNCHED OR REMAIN IN A TOWER ABORT MODE IF A TOWER ABORT WOULD RESULT IN A LAND LANDING WITH A HORIZONTAL VELOCITY COMPONENT OF GREATER THAN 54 FEET PER SECOND AT IMPACT. IN ALL CASES, THE LAUNCH DIRECTOR WILL BE PRIME FOR CALLING HOLDS FOR LAND LANDING LAUNCH WIND VIOLATIONS.</p> <p>C. THE LAUNCH WILL NOT BE ATTEMPTED IF THE MINIMUM GROUND INSTRUMENTATION CAPABILITY IS COMPROMISED. CONTINUOUS TRACKING COVERAGE IS REQUIRED FROM LIFTOFF THROUGH LIFTOFF PLUS 10 MIN. CONTINUOUS TM AND VOICE ARE REQUIRED FROM LIFTOFF THROUGH INSERTION.</p>						
	2-2	<p><u>LAUNCH</u></p> <p>IT IS PREFERABLE TO GO INTO ORBIT RATHER THAN PERFORM A LAUNCH ABORT. THEREFORE, THE LAUNCH WILL BE CONTINUED AS LONG AS THE CREW CONDITION IS SATISFACTORY, NO S/C OR SLV PROBLEMS EXIST WHICH JEOPARDIZE CREW SAFETY, AND SUFFICIENT CONSUMABLES, COOLANT, AND ELECTRICAL ENERGY REMAIN FOR AT LEAST ONE REVOLUTION PLUS ENTRY.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-1	Tape 11.1

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## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONTINUED

R	ITEM							
	2-3	<p><u>EARTH ORBIT</u></p> <p>A. ENTRY WILL BE MADE AT THE NEXT BEST PTP WHEN ONE MORE CSM FAILURE WILL RESULT IN AN ASAP ENTRY OR UNCONTROLLABLE CONDITIONS.</p> <p>B. ADEQUATE CONSUMABLES WILL BE MAINTAINED FOR ENTRY IN THE NEXT PTP, MAKING ALLOWANCES FOR SETUP AND ENTRY.</p> <p>C. THE DEORBIT CAPABILITIES REQUIRED FOR EARTH ORBIT ARE:</p> <ol style="list-style-type: none"> <li>1. TWO METHODS OF DEORBIT ARE REQUIRED.</li> <li>2. IF A SUBSEQUENT SINGLE FAILURE WOULD PRECLUDE DEORBIT BY EITHER METHOD REMAINING, THE CSM WILL DEORBIT.</li> <li>3. SPS IS THE PRIME METHOD OF DEORBIT AND SUFFICIENT <math>\Delta V</math> WILL BE RESERVED FOR THIS MANEUVER.</li> <li>4. SM-RCS (4 QUAD) AND SM-CM/RCS HYBRID WILL BE CONSIDERED AS INDEPENDENT DEORBIT METHODS AS LONG AS INDIVIDUAL SM-RCS QUAD AND GNCS INTEGRITY IS MAINTAINED AND SUFFICIENT RCS PROPELLANT IS AVAILABLE.</li> <li>5. THE LM PROPULSION SYSTEM (DPS OR RCS) MAY BE USED TO PLACE THE CSM IN AN ORBIT (<math>H_p \geq 80</math> NM) FROM WHICH A SM-RCS OR SM-CM/RCS HYBRID DEORBIT CAN BE CONDUCTED.</li> <li>6. UTILIZATION OF BACKUP DEORBIT METHODS WILL BE BASED ON THE FOLLOWING PRIORITIES:               <ol style="list-style-type: none"> <li>(A) SM-RCS</li> <li>(B) LM PROP PLUS SM-RCS</li> <li>(C) SM-CM/RCS HYBRID</li> <li>(D) LM PROP PLUS SM-CM/RCS HYBRID</li> </ol> </li> </ol> <p>RULE NUMBERS 2-4 THROUGH 2-10 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-2	Tape 6.2

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONTINUED

R	ITEM															
	2-11	<p><u>TRANSLUNAR INJECTION</u></p> <p>A. THE TLI WILL BE GO IF THE S/C AND L/V SATISFY THE FOLLOWING CRITERIA:</p> <ol style="list-style-type: none"> <li>1. THERE HAVE BEEN NO FAILURES IN THE LAUNCH VEHICLE WHICH RESULT IN A CATASTROPHIC HAZARD.</li> <li>2. A "GO FOR TLI" RECOMMENDATION WILL BE GIVEN IF ENOUGH PROPELLANT IS AVAILABLE AND THE SLV HARDWARE STATUS IS DEEMED ADEQUATE FOR A REASONABLE PROBABILITY OF REACHING A 28,000 NM APOGEE. THE FINAL DECISION RESTS WITH THE FLIGHT DIRECTOR FOR DETERMINING A REASONABLE PROBABILITY.</li> <li>3. THE CSM HAS TOTAL SYSTEMS CAPABILITY WITH REDUNDANCY. REDUNDANCY VERIFICATION IS SUBJECT TO THE NUMBER AND TYPE OF REDUNDANT COMPONENT CHECKS WHICH CAN BE PERFORMED IN EARTH ORBIT.</li> </ol> <p>B. THE TLI MANEUVER WILL BE DELAYED UNTIL THE SECOND OPPORTUNITY FOR SUSPECTED FAILURE OF A CRITICAL SYSTEM (PRIME OR BACKUP - MANEUVER, LIFE SUPPORT, COOLING, POWER SEQUENTIAL, COMMUNICATIONS) WHICH REQUIRES TIME FOR EVALUATION.</p> <p>C. TLI TARGETING WILL BE SUCH THAT A SAFE CIRCUMLUNAR RETURN TO EARTH CAN BE RE-ESTABLISHED WITHIN LM DPS CAPABILITY AS LATE AS PC + 2 HRS. THE CAPABILITY WILL EXIST TO ESTABLISH A SAFE CIRCUMLUNAR RETURN TO EARTH WITH THE SM-RCS UNTIL TLI + 5 HRS.</p>														
	2-12	<p><u>TRANSPOSITION, DOCKING AND EJECTION (TD&amp;E)</u></p> <p>A. THE NORMAL MINIMUM CABIN PRESSURE REDLINE OF 4.0 PSIA FOR TUNNEL/LM PRESSURIZATION SEQUENCES MAY BE WAIVED DURING TD&amp;E. THE CM WILL BE DEPRESSURIZED AS REQUIRED TO ACCOMPLISH HATCH REMOVAL FOR UMBILICAL HOOKUP OR DOCKING INTERFACE INSPECTION.</p> <p>B. IF NORMAL LM EJECTION IS NOT SUCCESSFUL, NO ATTEMPT WILL BE MADE TO MAN THE LM AND "STAGE" TO RECOVER THE ASCENT STAGE.</p>														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>FLIGHT OPS RULES</td> <td>GENERAL</td> <td>2-3</td> <td style="text-align: right;">Tape 50.2</td> </tr> </tbody> </table>			MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-3	Tape 50.2
MISSION	REV	DATE	SECTION	GROUP	PAGE											
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## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONTINUED

R	ITEM															
	2-13	<p><u>TRANSLUNAR COAST</u></p> <p>A. NO MCC WILL BE PERFORMED IF LOI CAN BE TARGETED WITHIN OPERATIONAL CONSTRAINTS.</p> <p>B. TRANSLUNAR COAST WILL BE TERMINATED IF ADEQUATE CONSUMABLES (CSM AND/OR LM) ARE NOT AVAILABLE FOR A CIRCUMLUNAR EARTH RETURN + 12 HRS AND A TLC DIRECT ABORT PROVIDES AN EARLIER LANDING TIME.</p> <p>C. THE CREW WILL MAN THE LM FOR BACKUP COMMUNICATIONS (VOICE, TM, TRACK) IF CSM COMMUNICATIONS ARE LOST WITH THE MSFN. WITH LOSS OF CSM COMMUNICATIONS, A LUNAR ORBIT MISSION WILL BE FLOWN UTILIZING THE LM COMMUNICATIONS SYSTEMS.</p> <p>D. MCC'S WILL BE DESIGNED TO MEET LOI TARGETING CONSTRAINTS WHILE RESERVING A CAPABILITY TO PERFORM A RETURN TO EARTH MANEUVER WITH DPS ENGINE AS LATE AS 2 HOURS AFTER PERILUNE ON THE CIRCUMLUNAR TRAJECTORY.</p> <p>E. FOR A CSM SOLO MISSION, MCC'S WILL BE TARGETED SO A SAFE CIRCUMLUNAR RETURN TO EARTH CAN BE ESTABLISHED WITHIN RCS CAPABILITY.</p> <p>F. SIM BAY EXPERIMENT OPERATION DURING TLC</p> <p style="margin-left: 20px;">1. ALL CREWMEN WILL BE IN THE CSM FOR SIM BAY DOOR JETTISON.</p> <p style="margin-left: 20px;">2. A NO-GO FOR LOI WILL NOT PRECLUDE SIM BAY DOOR JETTISON.</p>														
	2-14	<p><u>LUNAR ORBIT INSERTION</u></p> <p>A. LOI WILL BE INHIBITED AND A LUNAR FLYBY PERFORMED IF THE CSM DOES NOT SATISFY ANY OF THE FOLLOWING CONDITIONS:</p> <p style="margin-left: 20px;">1. FULL CRITICAL SYSTEMS REDUNDANCY</p> <p style="margin-left: 20px;">2. ADEQUATE CONSUMABLES FOR MINIMUM LUNAR ORBIT OPERATIONS WITH CAPABILITY TO SUSTAIN A CRYO TANK LOSS AND RETURN TO EARTH WITH AN AVERAGE POWER LEVEL OF 40 AMPS</p> <p style="margin-left: 20px;">3. SPS PROPELLANT RESERVE CAPABILITY FOR TEI AND TRANSEARTH MCC'S</p> <p style="margin-left: 20px;">4. RCS PROPELLANT RESERVE TO ACCOMPLISH TEI CONTROL, TRANSEARTH MCC CONTROL, PTC, MINIMUM TRANSEARTH AND LUNAR ORBIT OPERATIONS</p> <p>B. A DPS LOI MAY BE PERFORMED IF REQUIRED TO ACCOMPLISH A LUNAR ORBIT MISSION.</p> <p>C. FOR A CSM SOLO MISSION, THE SIM BAY DOOR MUST BE JETTISONED (ALLOWING SIM BAY SCIENCE OPERATIONS) TO BE GO FOR LOI.</p>														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 5%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 10%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 20%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>FLIGHT OPS RULES</td> <td>GENERAL</td> <td>2-4</td> <td style="text-align: right;">Tape 55.2</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-4	Tape 55.2
MISSION	REV	DATE	SECTION	GROUP	PAGE											
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## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONTINUED

R	ITEM							
	2-15	<p><u>LUNAR ORBIT</u></p> <p>A. FOR LOI DISPERSIONS, IF A STABLE ORBIT HAS NOT BEEN ACHIEVED, A DPS 30-MINUTE ABORT OR A DPS 2-HOUR ABORT WILL BE EXECUTED FOLLOWED BY A SUBSEQUENT DPS (OR APS) MANEUVER IF REQUIRED.</p> <p>B. DESIGNED REDUNDANT CAPABILITY MUST BE MAINTAINED IN ALL CSM SYSTEMS CRITICAL FOR TEI AND LIFE SUPPORT.</p> <p>C. SUFFICIENT CONSUMABLES MUST REMAIN TO COMPLETE THE NEXT MISSION PHASE WITH CAPABILITY TO SUSTAIN A CRYO TANK LOSS DURING THE PHASE AND RETURN TO EARTH WITH AN AVERAGE POWER LEVEL OF 40 AMPS.</p> <p>D. THE CSM MUST MAINTAIN AN SPS FUEL RESERVE CAPABILITY FOR THE TEI MANEUVERS AND TRANSEARTH MCC'S.</p> <p>E. THE CSM MUST MAINTAIN RCS PROPELLANT RESERVE TO ACCOMPLISH TEI CONTROL, TEC MCC CONTROL, PTC, AND MINIMAL TRANSEARTH OPERATIONS.</p> <p>F. IF A LANDING MISSION IS NOT POSSIBLE, THE ALTERNATE MISSION WILL NOT BE SHORTENED SOLELY TO ALLOW DPS TEI CAPABILITY. IF THE DPS IS AVAILABLE AT THE TEI TIME, IT WILL BE USED FOR TEI.</p> <p>G. LUNAR ORBIT SCIENCE OPERATIONS</p> <ol style="list-style-type: none"> <li>1. NO EVA WILL BE PERFORMED FOR SYSTEMS TROUBLE SHOOTING ON AN INDIVIDUAL SIM BAY MALFUNCTION.</li> <li>2. DURING LUNAR SOUNDERS OPERATIONS, IF EMI RESULTS IN DEGRADATION OR LOSS OF TM, THE LUNAR SOUNDER OPERATION MAY BE CONTINUED DEPENDING ON THE STATUS OF CSM SYSTEMS.</li> </ol>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-5	Tape 53.1

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONTINUED

R	ITEM							
	2-16	<u>DESCENT ORBIT INSERTION (DOI)</u>	DOI <sub>1</sub> WILL BE PERFORMED ONLY IF A LUNAR LANDING MISSION CAN BE ACCOMPLISHED, OTHERWISE AN LOI-2 MANEUVER WILL BE PERFORMED TO ATTAIN APPROXIMATELY A 60 NM CIRCULAR ORBIT.					
	2-17	<u>INTRAVEHICULAR TRANSFER</u>	ONE HARDSUIT IVT FROM THE CSM TO THE LM WILL BE ACCOMPLISHED IF A REASONABLE CHANCE EXISTS THAT CORRECTIVE ACTION CAN BE TAKEN FOR A LM/TUNNEL PRESSURIZATION.					
	2-18	<u>DOCKED LM OPERATIONS</u>	FOR AN IMPENDING HAZARDOUS SITUATION RESULTING FROM A DESCENT STAGE PROBLEM, THE STAGE WILL BE JETTISONED AND ASCENT STAGE OPERATIONS WILL CONTINUE AFTER THE VEHICLE HAS MOVED TO A SAFE DISTANCE.					
			RULES NUMBERS 2-19 AND 2-20 ARE RESERVED.					
	2-21	<u>CSM/LM UNDOCKING AND SEPARATION</u>	<p>A. A MANNED LM WILL NOT BE UNDOCKED FROM THE CSM WITHOUT INDEPENDENT MANEUVER CAPABILITY OF BOTH VEHICLES TO RENDEZVOUS.</p> <p>B. EVT CAPABILITY IS REQUIRED FOR MANNED UNDOCKING.</p> <p>C. VHF COMMUNICATIONS ARE MANDATORY FOR SEPARATION.</p>					
	2-22	<u>CSM LUNAR ORBIT UNDOCKED</u>	<p>A. UNDOCKING TO PDI</p> <ol style="list-style-type: none"> <li>LOSS OF REDUNDANT CAPABILITY IN CRITICAL SYSTEMS WILL BE CAUSE TO TERMINATE THE LANDING MISSION. LM SYSTEMS MAY BE UTILIZED TO PROVIDE SYSTEMS REDUNDANCY FOR CONTINUATION OF AN ALTERNATE MISSION.</li> <li>LOSS OF CSM RESCUE CAPABILITY WILL BE CAUSE FOR TERMINATING THE MISSION AND PERFORMING A LM ACTIVE RENDEZVOUS ASAP.</li> </ol> <p>B. PDI TO LANDING</p> <p>NO CSM FAILURES WILL BE CAUSE FOR ABORT DURING POWERED DESCENT EXCEPT THOSE CONFIRMED SPS FAILURES REQUIRING RETENTION OF LM PROPULSION CAPABILITY.</p> <p>C. LUNAR STAY</p> <p>FAILURE TO MAINTAIN REDUNDANT CAPABILITY IN SYSTEMS REQUIRED FOR TEI OR LIFE SUPPORT WILL BE CAUSE FOR TERMINATION OF LUNAR STAY.</p>					
			MISSION	REV	DATE	SECTION	GROUP	PAGE
			APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-6
								Tape 50.3

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONTINUED

R	ITEM							
	2-23	RESERVED						
	2-24	<p><u>LM PDI</u></p> <p>FOR PDI, THE LM MUST MEET THE LUNAR STAY WITH EVA CRITERIA, AND MUST HAVE THE CAPABILITY TO LAND, ASCEND, AND RENDEZVOUS WITHOUT VIOLATING ANY SPECIFIC MISSION RULES OR REDLINES.</p>						
	2-25	<p><u>LM POWERED DESCENT</u></p> <p>IF A SYSTEMS FAILURE OCCURS AND A CHOICE IS AVAILABLE -</p> <p>A. <u>PDI TO HIGH GATE</u></p> <p>REDUNDANT CAPABILITY OF CRITICAL LM SYSTEMS AND SYSTEMS NEEDED FOR AN EVA ARE REQUIRED TO HIGH GATE. EARLY IN POWERED DESCENT, IF AN ABORT IS REQUIRED, IT IS PREFERABLE TO ABORT WHEN DPS TO ORBIT CAPABILITY (AND THE SHORTER RENDEZVOUS) ARE AVAILABLE.</p> <p>B. <u>HIGH GATE TO TOUCHDOWN</u></p> <p>BECAUSE OF LIMITED TIME FOR PROBLEM VERIFICATION AND SYSTEM RECONFIGURATION, IT IS PREFERABLE TO LAND THAN ABORT. IF THE INDICATED FAILURE WILL ALLOW A SAFE LANDING AND ASCENT INTO AN ACCEPTABLE ORBIT, A LANDING WILL BE ACCOMPLISHED.</p>						
	2-26	<p><u>LM LUNAR STAY</u></p> <p>A. ONLY THOSE TIME-CRITICAL SYSTEMS FAILURES OR TRENDS THAT INDICATE IMPENDING LOSS OF THE CAPABILITY TO ASCEND AND ACHIEVE A SAFE ORBIT WILL BE CAUSE FOR AN IMMEDIATE ABORT (ANYTIME LIFTOFF) FROM THE LUNAR SURFACE.</p> <p>B. LOSS OF REDUNDANT CAPABILITY IN CRITICAL LM SYSTEMS IS CAUSE FOR ABORT AT THE NEXT BEST OPPORTUNITY.</p>						
			MISSION	REV	DATE	SECTION	GROUP	PAGE
			APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-7
								Tape 6.7

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONTINUED

R	ITEM							
	2-27	<p><u>LUNAR SURFACE EVA'S</u></p> <p>A. FOR THE NOMINAL (TWO-MAN) EVA, TOTAL EMU LIFE SUPPORT SYSTEMS CAPABILITY AND CRITICAL INSTRUMENTATION FOR BOTH ASTRONAUTS ARE REQUIRED.</p> <p>B. A ONE-MAN EVA MAY BE INITIATED.</p> <p>C. THE ACTIVATION OF THE OPS IN THE MAKEUP MODE WILL REQUIRE EXPEDITIOUS COMPLETION OF THE SPECIFIC ACTIVITY BEING PERFORMED, FOLLOWED BY IMMEDIATE RETURN TO THE LM. ACTIVATION OF THE OPS HIGH OR LOW PURGE MODE WILL REQUIRE IMMEDIATE RETURN TO THE LM.</p> <p>D. THE OPERATIONAL EVA PLAN WILL BE CONSTRAINED TO A MAXIMUM DURATION OF 7 HOURS.</p> <p>E. AN EVA TRAVERSE LIMIT WILL BE APPLIED ALLOWING ONE FAILURE (LRV OR PLSS) WITH THE CAPABILITY TO RETURN TO THE LM. THE MAXIMUM ACCEPTABLE CREW HEAT STORAGE IS 300 BTU'S.</p> <p>F. ALL PLANNED EVA'S WILL INCLUDE A 30-MINUTE, POST-EVA RESERVE ON EMU CONSUMABLES.</p> <p style="margin-left: 20px;">1. TWO-MAN EVA</p> <p style="margin-left: 40px;"><u>OPERATIONAL LRV</u></p> <p style="margin-left: 60px;">(A) EVA EXCURSIONS WILL BE LIMITED TO ALLOW PLSS WALKBACK ASSUMING NO PLSS FAILURES.</p> <p style="margin-left: 60px;">(B) EVA EXCURSIONS WILL BE LIMITED TO SUPPORT RIDEBACK WITH A FAILED PLSS, USING BSLSS AND THE OPS IN LOW PURGE FLOW. WITH NO BSLSS, A COMBINATION OF HI AND LO PURGE FLOW WILL BE USED FOR RETURN AND INGRESS WITH A PAD ADDED TO THE LO PURGE FLOW PHASE.</p> <p style="margin-left: 40px;"><u>NO LRV AVAILABLE</u></p> <p style="margin-left: 60px;">(A) EVA EXCURSIONS WILL BE LIMITED TO A BSLSS WALKBACK CAPABILITY USING THE OPS IN LOW PURGE FLOW.</p> <p style="margin-left: 60px;">(B) WITH NO BSLSS, THE EVA EXCURSIONS WILL BE LIMITED, ALLOWING LM RETURN USING THE OPS IN HIGH PURGE FLOW.</p> <p style="margin-left: 20px;">2. ONE-MAN EVA</p> <p style="margin-left: 40px;"><u>OPERATIONAL LRV</u></p> <p style="margin-left: 60px;">(A) EVA EXCURSIONS WILL BE LIMITED TO PLSS WALKBACK CAPABILITY ASSUMING NO PLSS FAILURES.</p> <p style="margin-left: 60px;">(B) EVA EXCURSIONS WILL BE LIMITED, ALLOWING DRIVEBACK AND INGRESS USING THE OPS IN A COMBINATION OF LO AND HI PURGE FLOW WITH A PAD ADDED TO THE LO PURGE FLOW PHASE.</p> <p style="margin-left: 40px;"><u>NO LRV AVAILABLE</u></p> <p style="margin-left: 60px;">(A) EVA EXCURSIONS WILL BE LIMITED TO ALLOW WALKBACK TO THE LM, USING THE OPS IN HIGH PURGE FLOW.</p> <p>G. COMMUNICATIONS</p> <p>1. FOR THE NORMAL (TWO-MAN) EVA, MSFN UPLINK VOICE AND DOWNLINK VOICE FROM ONE CREWMAN (OR TV DOWNLINK) ARE THE MINIMUM COMMUNICATION REQUIREMENTS.</p> <p>2. FOR NORMAL OPERATIONS, BOTH EVA CREWMEN WILL NOT REMAIN OUTSIDE OF MSFN COVERAGE FOR A PERIOD EXCEEDING 5 MINUTES. WITH LCRU/ANTENNA PROBLEMS PREVENTING COMM DURING A TRAVERSE, THE SURFACE OPERATIONS WILL CONTINUE IF MINIMUM COMM CAN BE RE-ESTABLISHED AT THE END OF EACH TRAVERSE.</p> <p>3. WITH THE LOSS OF TOTAL LCRU COMM CAPABILITY, THE CREW WILL RETURN TO THE VICINITY OF THE LM AND RE-ESTABLISH COMM WITH THE MCC VIA LM RELAY.</p> <p>4. WITH LOSS OF LM VHF COMMUNICATIONS THE CREW WILL EGRESS, ACTIVATE THE LCRU, AND CONTINUE NORMAL SURFACE OPERATIONS.</p> <p>5. THE LCRU MAY BE HAND CARRIED TO EXTEND THE ALLOWABLE TRAVERSE DISTANCES FROM THE LM OR THE LRV (AS REQUIRED) TO MAINTAIN COMMUNICATIONS.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-8	Tape 50.4

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## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONTINUED

R	ITEM							
	2-27 CONT	H. A VACUUM TRANSFER WILL ONLY BE ATTEMPTED IN AN EMERGENCY.						
		I. THE LM WILL NOT BE PRESSURIZED WITH A CREWMAN ON THE LUNAR SURFACE.						
		J. BOTH PLSS'S AND BOTH OPS WILL BE RETAINED UNTIL TWO LIFE SUPPORT UNITS (TWO OPS, TWO PLSS, OR ONE PLSS PLUS ONE OPS) HAVE BEEN VERIFIED TO HAVE SUFFICIENT CONSUMABLES TO SUPPORT CEVA.						
		K. FOR THE TWO-MAN EVA, THE CDR WILL ALWAYS EGRESS FIRST AND INGRESS LAST UNLESS THE CDR HAS INITIATED AN OPS PURGE. THIS WILL INSURE THAT THE CDR IS IN THE LEFT PILOT POSITION SHOULD ASCENT BE REQUIRED WITHOUT AN OPPORTUNITY TO DOFF THE EMU'S.						
	2-28	<u>ASCENT</u>						
		IN THE EVENT OF PROCEDURAL ERRORS OR SYSTEMS PROBLEMS WHICH RESULT IN LOSS OF SOME CAPABILITY USED FOR ASCENT OR FOR RENDEZVOUS AND WHICH CAN BE CORRECTED IN ONE REV, IT IS BETTER TO DELAY ASCENT FOR ONE REV AND CORRECT THE SITUATION THAN IT IS TO LIFT OFF ON TIME.						
	2-29	<u>RENDEZVOUS</u>						
		A. SELECTION OF THE ACTIVE VEHICLE FOR RENDEZVOUS AND DOCKING WILL BE DETERMINED BY THE FLIGHT DIRECTOR AND THE FLIGHT CREW BASED UPON CONSUMABLES AND SYSTEMS PERFORMANCE. THE TOTAL LM CAPABILITY WILL BE DEDICATED TO ACCOMPLISHING THE RENDEZVOUS.						
		B. THE DIRECT RNDZ PROFILE WILL BE PERFORMED IF THE MANDATORY CSM AND LM SYSTEM CONSTRAINTS CAN BE MET AND ALL PLANE ERROR CAN BE CORRECTED WITH ASCENT YAW STEERING. FOR ANY OTHER CASE, THE COELLIPTIC RENDEZVOUS WILL BE EXECUTED.						
	2-30	<u>RETENTION OF THE LM ASC STAGE</u>						
		CONSIDERATION WILL BE GIVEN TO RETAINING THE LM ASC STAGE TO PROVIDE REDUNDANT CAPABILITY AFTER CSM SYSTEM FAILURES. IF THE ASC STAGE MUST BE RETAINED FOR TEI, THE $\Delta V$ RESERVED FOR WEATHER AVOIDANCE MAY BE TRADED OFF TO ACCOMPLISH A FASTER EARTH RETURN TIME.						
			MISSION	REV	DATE	SECTION	GROUP	PAGE
			APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-9
								Tape 53.2

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 2 - FLIGHT OPERATIONS RULES - CONCLUDED

R	ITEM							
	2-31	<p><u>TRANSEARTH COAST</u></p> <p>A. THE STEEP TARGET LINE WILL BE USED FOR ALL MCC'S EXCEPT WHEN BOTH THE VELOCITY AT ENTRY INTERFACE IS LESS THAN 31,000 FPS AND THE G&amp;N IS "GO" - THEN THE SHALLOW TARGET LINE WILL BE USED.</p> <p>B. MCC'S MAY BE USED FOR LANDING AREA CONTROL PRIOR TO ENTRY INTERFACE MINUS 24 HOURS FOR RECOVERY ACCESS VIOLATIONS, UNACCEPTABLE WEATHER, OR LAND MASSES IN ANY PART OF THE OPERATIONAL FOOTPRINT.</p> <p>C. IF THE FLIGHTPATH ANGLE IS OUTSIDE THE ENTRY CORRIDOR, AN MCC WILL BE EXECUTED AS SOON AS PRACTICAL.</p> <p>D. MCC'S WILL BE ACCOMPLISHED BY THE SPS IF NECESSARY TO MAINTAIN RCS REDLINES.</p>						
	2-32	<p><u>TRANSEARTH COAST EVA</u></p> <p>A. THE TEC EVA WILL BE INITIATED ONLY FOR RETRIEVAL OF FILM FROM THE PAN CAMERA, MAPPING CAMERA, OR LUNAR SOUNDER.</p> <p>B. THE CSM OXYGEN SUPPLY, AND CRITICAL INSTRUMENTATION MUST ALL BE GO FOR EVA.</p> <p>C. ALL RCS THRUSTER FIRE IN THE VICINITY OF THE TRANSFER PATH MUST BE INHIBITED.</p> <p>D. SPACECRAFT ATTITUDE AND ATTITUDE RATES MUST BE WITHIN LIMITS THAT ALLOW SAFE EVA OPERATIONS WITH SUFFICIENT SUNLIGHT THROUGHOUT THE PLANNED EVA PERIOD.</p> <p>E. A VACUUM TRANSFER WILL ONLY BE ATTEMPTED IN AN EMERGENCY.</p> <p>F. ALL SIM BAY POWER WILL BE DISABLED FOR THE EVA.</p>						
	2-33	<p><u>ALTERNATE MISSION</u></p> <p>A. EARTH ORBIT</p> <p>1. <u>CSM ONLY</u> - EO SCIENCE, SPS INCLINATION CHANGE. ORBIT FOR SCIENCE OPERATIONS WILL BE A TRADE-OFF TO PROVIDE MOST OPTIMUM SIM BAY PHOTOGRAPHY AND LUNAR SOUNDER CONDITIONS YET REMAIN WITHIN RCS DEORBIT CAPABILITY.</p> <p>2. <u>CSM/LM</u> - EO SCIENCE, INCLINATION CHANGE, ESTABLISH ORBIT FOR OPTIMUM SIM BAY PHOTOGRAPHY AND LUNAR SOUNDER CONDITIONS.</p> <p>B. LUNAR ORBIT</p> <p>1. <u>CSM ONLY</u> - SIM BAY EXPERIMENTS. APPROXIMATELY 6-DAY STAY, LOI TARGETED FOR EASTERN NODAL LOCATION 60 NM CIRCULAR ORBIT.</p> <p>2. <u>CSM/LM</u> (NO LANDING CAPABILITY) - SIM BAY EXPERIMENTS. APPROXIMATELY 6-DAY STAY, 60 NM CIRCULAR ORBIT.</p> <p>C. IN ANY ALTERNATE MISSION WITHIN THE CONSTRAINTS OF PROPELLANT REMAINING AND OTHER OPERATIONAL CONSIDERATIONS SUCH AS CREW SAFETY AND SYSTEMS LIFETIME, THE COMBINED LM ASC/DES STAGES WILL BE DISPOSED OF IN THE FOLLOWING ORDER OF DESCENDING PRIORITY:</p> <p>1. LUNAR IMPACT</p> <p>2. OCEAN IMPACT</p> <p>3. LUNAR ORBIT</p>						
			MISSION	REV	DATE	SECTION	GROUP	PAGE
			APOLLO 17	FNL	9/1/72	FLIGHT OPS RULES	GENERAL	2-10
								Tape 55.3

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY

R	ITEM							
		<p>THIS SECTION IS A SUMMARY OF THE DATA PRIORITY GUIDELINES BY MISSION PHASE, SLV RULES BY MISSION PHASE, AND SYSTEMS GO/NO-GO CRITERIA ON CHARTS BY MISSION PHASE.</p> <p>THE SUMMARY RULES PLUS THE CHART ARE REQUIRED TO ENCOMPASS EACH PHASE.</p> <p>THE CAPABILITY LISTED IN THE CHARTS ARE THE REQUIREMENTS FOR INITIATION OR CONTINUATION OF A MISSION PHASE OR EVENT. MISSION EVENTS FROM UNDOCKING TO PDI IGNITION REQUIRE THAT THE VEHICLES MEET THE LUNAR STAY WITH EVA CRITERIA AND HAVE THE CAPABILITY TO LAND, ASCEND, AND RENDEZVOUS.</p>						
		<p>LAUNCH PHASE</p>						
	3-1	<p>THE LAUNCH WILL BE ABORTED FOR THE FOLLOWING REASONS:</p> <p>A. SLV</p> <ul style="list-style-type: none"> <li>S-IC ADJACENT ENGINES OUT (TIME DEPENDENT)</li> <li>S-II GIMBAL ACTUATOR HARDOVER INBOARD PRIOR TO "S-IVB TO COI" CAPABILITY</li> <li>VIOLATION OF AUTO/MANUAL EDS LIMITS</li> <li>S-II ENGINE FAILURES (TIME DEPENDENT)</li> <li>S-II LOSS OF CONTROL (TIME DEPENDENT)</li> <li>FAILURE OF SECOND PLANE SEPARATION</li> <li>S-IVB LOSS OF HYDRAULIC FLUID (PRIOR TO S-IVB IGNITION)</li> <li>S-IVB LOSS OF THRUST (TIME DEPENDENT) (POSSIBLE COI CAPABILITY)</li> <li>S-IVB COLD He SHUTOFF VALVE(S) FAILED OPEN</li> <li>S-IVB LOX CRYO REPRESS VLV(S) FAILS OPEN (REF. RULE 6-5)</li> </ul> <p>B. CSM</p> <ol style="list-style-type: none"> <li>1. ENVIRONMENTAL <ul style="list-style-type: none"> <li>LOSS OF CABIN AND SUIT PRESSURE</li> <li>LOSS OF CABIN PRESSURE AND SUIT CIRCULATION</li> <li>FIRE/SMOKE IN CM</li> <li>LOSS OF CABIN PRESSURE AND O<sub>2</sub> MANIFOLD LEAK</li> </ul> </li> <li>2. ELECTRICAL <ul style="list-style-type: none"> <li>THE FOLLOWING POWER SOURCES ARE REQUIRED TO CONTINUE LAUNCH: <ul style="list-style-type: none"> <li>(A) ONE F/C OR AUX BAT PLUS ONE ENTRY BAT, OR</li> <li>(B) THREE ENTRY BATS</li> </ul> </li> <li>UNCONTROLLABLE SHORTED MAIN BUS</li> <li>LOSS OF BOTH AC BUSES DURING MODE I OR MODE II</li> </ul> </li> <li>3. PROPULSION <ul style="list-style-type: none"> <li>SUSTAINED LEAK OR LOSS OF He MANIFOLD PRESSURE IN BOTH CM-RCS RINGS (MODE I ONLY)</li> </ul> </li> </ol> <p>C. VIOLATION OF TRAJECTORY LIMIT LINES</p> <p>D. TEAM DISCRETION WILL BE USED FOR:</p> <ol style="list-style-type: none"> <li>1. SUIT/CABIN CONTAMINATION</li> <li>2. MEDICAL PROBLEMS</li> </ol>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LAUNCH PHASE	3-1	Tape 55.4

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
3-2	<p>THE S-IVB EARLY STAGING WILL BE USED AFTER "S-IVB TO COI" CABAPILITY FOR THE FOLLOWING:</p> <p style="margin-left: 40px;">S-II GIMBAL ACTUATOR INBOARD HARDOVER S-II LOSS OF CONTROL S-II ENGINE FAILURES S-IVB COLD He SHUTOFF VALVE(S) FAILS OPEN (AFTER TWR JETT)</p>							
3-3	<p>SWITCHOVER TO CSM GUIDANCE WILL BE PERFORMED FOR:</p> <p style="margin-left: 40px;">SATURN GUIDANCE REFERENCE FAILURE</p> <p style="margin-top: 20px;">RULE NUMBERS 3-4 THROUGH 3-10 ARE RESERVED.</p>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LAUNCH PHASE	3-2	Tape 8.2

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM								
		<u>EARTH ORBIT</u>							
	3-11	<p>CSM SEPARATION FROM THE S-IVB (WITHOUT LM EXTRACTION) WILL BE PERFORMED EARLY FOR THE FOLLOWING SLV CONDITIONS (CONSIDERATION WILL BE GIVEN TO EXTRACTING THE LM LATER IF THE CONDITION CAN BE CORRECTED):</p> <ul style="list-style-type: none"> <li>A. S-IVB RANGE SAFETY PROPELLANT DISPERSAL SYSTEM ARMS INADVERTENTLY AFTER INSERTION AND PRIOR TO SAFING*</li> <li>B. S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI* (REFERENCE RULES 6-5 AND 7-6)</li> <li>C. LOSS OF ATTITUDE CONTROL DURING TB5 (CREW DISCRETION)</li> <li>D. S-IVB COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS*</li> <li>E. START BOTTLE GREATER THAN 1800 PSIA*</li> </ul> <p style="text-align: center;">*PERFORM SPS MANEUVER TO A SAFE DISTANCE.</p>							
	3-12	<p>CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR:</p> <ul style="list-style-type: none"> <li>A. S-IVB NO-GO FOR TLI</li> <li>B. CSM NO-GO FOR TLI BUT GO FOR EARTH ORBIT MISSION</li> </ul>							
	3-13	<p>TLI WILL BE INHIBITED FOR:</p> <ul style="list-style-type: none"> <li>A. INSUFFICIENT PROPELLANT REMAINS FOR ACHIEVING A 28K NM APOGEE ELLIPSE</li> <li>B. S-IVB ENGINE MAIN LOX VALVE FAILS TO CLOSE AT CUTOFF</li> <li>C. LOSS OF ATTITUDE CONTROL</li> <li>D. CONFIRMED ACTUATOR HARDOVER</li> <li>E. LOSS OF ENGINE HYDRAULIC FLUID</li> <li>F. MISALIGNMENT RATE BETWEEN THE IU AND IMU IS OUTSIDE LIMITS</li> <li>G. UNACCEPTABLE DIFFERENCES BETWEEN CMC AND IU PLATFORM VELOCITY COMPONENTS OR TOTAL VELOCITY AT INSERTION</li> <li>H. UNACCEPTABLE DIFFERENCE BETWEEN MSFN AND IU ORBITAL DECISION PARAMETERS</li> </ul>							
	3-14	<p>TLI WILL BE TERMINATED FOR:</p> <ul style="list-style-type: none"> <li>A. PITCH OR YAW BODY RATES GREATER THAN 10 DEG/SEC</li> <li>B. ROLL BODY RATE GREATER THAN 20 DEG/SEC</li> <li>C. PITCH OR YAW ATTITUDE DEVIATIONS FROM NOMINAL PROFILES IN EXCESS OF 45 DEG</li> <li>D. OVERBURN WHERE <math>T_{GO}</math> (CMC) EQUALS ZERO PLUS 1 SECOND</li> </ul>							
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	EARTH ORBIT	3-3	Tape 55.5



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MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
		<u>TD&amp;E</u>						
	3-21	<p>TD&amp;E WILL NOT BE PERFORMED FOR:</p> <p>A. PILOT'S EVALUATION OF RATES AND ATTITUDES, AND SLA CONFIGURATION NOT ACCEPTABLE.</p> <p>B. THE SLV IS NO-GO FOR:</p> <ol style="list-style-type: none"> <li>1. VIOLATION OF S-IVB BULKHEAD <math>\Delta P</math> LIMITS</li> <li>2. LOX TANK PRESSURE GREATER THAN 50 PSI</li> </ol> <p>RULE NUMBERS 3-22 THROUGH 3-29 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	TD&E	3-5	Tape 8.5

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
		<u>TRANSLUNAR COAST</u>						
	3-30	THE G&N WILL BE THE PRIMARY MODE OF EXECUTING TRANSLUNAR MCC.						
	3-31	MIDCOURSE CORRECTION NOMINAL EXECUTION POINTS WILL BE AT THE FOLLOWING:						
		A. TLI C/O + 9 HOURS						
		B. TLI C/O + 28 HOURS						
		C. LOI - 22 HOURS						
		D. LOI - 5 HOURS						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	TRANSLUNAR COAST	3-6	Tape 55.6

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM						
	3-32	DURING THE LOI BURN, THE FLIGHT CREW WILL TAKE THE FOLLOWING ACTION:					
		<u>LOI ABORT MODES</u>					
		<u>MODE</u>	<u>TIME</u>	<u>DELTA VM</u>	<u>TYPE ABORT</u>		
		I	0 TO 0:32 0:32 TO 0:53 0:53 TO 1:31	0 TO 207 207 TO 348 348 TO 613	DPS 2-HR DIRECT ABORT DPS 30-MIN DIRECT ABORT DPS TO DEPLETION 30-MIN DIRECT ABORT FOLLOWED BY AN APS BURN 2 HOURS LATER		
		II	1:31 TO 2:03  2:03 TO 2:54	613 TO 833  833 TO 1200	DPS + APS 2-IMPULSE CIRCUMLUNAR ABORT WITH APS BURN TO SUPPLEMENT DPS BURN TO DEPLETION DURING SECOND IMPULSE (APS BURN IS 2 HRS AFTER DPS BURN) DPS 2-IMPULSE CIRCUMLUNAR ABORT		
		III	2:54 TO 6:35	1200 TO 2980	EXECUTE TEI (SPS OR DPS) AT NEXT OPPORTUNITY OR INITIATE ALTERNATE MISSION		
		(FOR APOLLO 17 APS IS REQUIRED TO SUPPLEMENT DPS FOR LOI BURN TIME FROM 4:30 TO 6:35)					
		A. ALL ABORT MANEUVERS ARE MCC TARGETED EXCEPT THE DPS 30-MIN ABORT WHICH IS TAKEN FROM THE CREW CHART.					
		B. CONTROL LIMITS APPLY AS FOLLOWS:					
		<u>LOI DELTA T</u>	<u>LOI DELTA V</u>	<u>LIMITS</u>			
		0 TO 0:53	0 TO 348	TIGHT			
		0:53 TO 3:40	348 TO 1543	LOOSE			
		3:40 TO 6:35	1543 TO 2980	TIGHT			
		<u>NOTE</u>					
		IF ANY BALL VALVE CLOSES PREMATURELY, SHUT DOWN GOOD BANK 10 SEC PRIOR TO CUTOFF FOR VERIFICATION OF THE FAILURE.					
		<u>NOTE</u>					
		REFERENCE RULE 3-86 FOR DEFINITION OF TIGHT AND LOOSE LIMITS.					
		RULE NUMBERS 3-33 THROUGH 3-37 ARE RESERVED.					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	TRANSLUNAR COAST	3-7
							Tape 55.7

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## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
		<u>LUNAR ORBIT</u>						
3-38		<p>PRIOR TO UNDOCKING, CSM MANEUVERS WILL BE SCHEDULED WHEN REQUIRED TO CORRECT THE FOLLOWING SITUATIONS:</p> <p>A. MISS DISTANCE OVER THE LLS GREATER THAN 0.5 DEG OUT OF PLANE</p> <p>B. DEVIATION IN APPROACH AZIMUTH GREATER THAN ±10 DEG FROM THE NOMINAL</p> <p>C. CURRENT PERICYNTHION ALTITUDE LESS THAN 30,000 FT</p>						
3-39		<p><u>DOI</u>, <u>RESIDUALS</u></p> <p>A. TRIM G&amp;N X AXIS TO WITHIN 1 FPS.</p> <p>1. FOR OVERBURNS LESS THAN 2.2 FPS, TRIM TO -1 FPS WITH THE -X SM RCS THRUSTERS.</p> <p>2. FOR OVERBURNS GREATER THAN 2.2 FPS BUT LESS THAN 10 FPS, PITCH 180 DEGREES AND TRIM TO 1 FPS USING +X SM RCS THRUSTERS.</p> <p>3. RESIDUALS GREATER THAN 10 FPS WILL BE TRIMMED USING SPS.</p> <p>B. IF THE G&amp;N HAS OBVIOUSLY MALFUNCTIONED, THE NEGATIVE RESIDUAL INDICATED BY THE EMS WILL BE TRIMMED.</p>						
3-40		RESERVED						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR ORBIT	3-8	
								Tape 55.8

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## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM															
	3-41	<p>AT AOS AFTER DOI<sub>1</sub>, THE REQUIREMENT FOR THE BAILOUT MANEUVER WILL BE DETERMINED BY EVALUATION OF THE THREE TRAJECTORY MONITORING SOURCES. THESE SOURCES - G&amp;N, EMS, AND MSFN - WILL BE EXAMINED WITH THE FOLLOWING CRITERIA:</p> <p>A. IF MSFN RADAR DATA IS VALID AND REASONABLE, A STAY VOTE FROM MSFN IS REQUIRED TO REMAIN IN THE LOW ORBIT.</p> <p>B. IF MSFN RADAR DATA IS INVALID OR UNAVAILABLE, THE FOLLOWING CRITERIA APPLY:</p> <ol style="list-style-type: none"> <li>1. IF THE G&amp;N AND EMS ARE AVAILABLE, BOTH SOURCES MUST INDICATE STAY TO REMAIN IN THE LOW ORBIT.</li> <li>2. IF ONLY ONE OF THE ONBOARD SOURCES (G&amp;N, EMS) IS AVAILABLE, BOTH THAT SYSTEM AND BURN TIME MUST INDICATE STAY TO REMAIN IN THE LOW ORBIT.</li> </ol> <p style="text-align: center;"><u>NOTES</u></p> <ol style="list-style-type: none"> <li>1. THE EMS VOTE IS NO STAY IF THE EMS INDICATES A <u>10</u>-FPS OVERSPEED AFTER TRIMMING THE G&amp;N.</li> <li>2. THE MSFN VOTE IS NO STAY IF THE INCOMING RADAR DATA INDICATES A CLOSEST APPROACH ALTITUDE OF EQUAL TO OR LESS THAN 1.0 NM ABOVE THE ACTUAL LUNAR TERRAIN. THIS ALTITUDE CORRESPONDS TO A PERICYNTHION ALTITUDE OF <u>3.38</u> NM. THE CORRESPONDING DOPPLER RESIDUALS ARE APPROXIMATELY <u>-106</u> CYCLES PER SEC. BUT THE ACTUAL NUMBER WILL BE DETERMINED REAL TIME.</li> <li>3. BURN TIME IS NO STAY IF AN OVERBURN OF <u>1.8</u> SECONDS IS INDICATED.</li> </ol>														
	3-42	<p>THE FOLLOWING CRITERION APPLY TO DOI<sub>2</sub>:</p> <p>A. VOICE CONFIRMATION OF CIRC IS REQUIRED FOR EXECUTION.</p> <p>B. DOI<sub>2</sub> WILL BE SCHEDULED AT LEAST 2 MIN AFTER CIRC.</p> <p>C. LM RCS BURN TIME WILL BE <u>≤ 30</u> SEC.</p> <p>D. TARGETED PERILUNE AT PDI WILL BE NO LESS THAN 40K FT.</p>														
	3-43	<p>THE FOLLOWING RNDZ/RESCUE OPTIONS WILL BE UTILIZED AS NECESSARY FOR FAILURES REQUIRING TERMINATION OF LUNAR LANDING:</p> <p>A. FOR FAILURES FROM SEPARATION TO CIRCULARIZATION, THE NOMINAL RNDZ IS A P34 PROFILE WITH DOCKING OCCURRING 2 HRS AFTER SEP.</p> <p>B. FOR FAILURES FROM CIRCULARIZATION TO PDI, EXECUTE THE NO PDI +12 ABORT SEQUENCE WITH DOCKING IN ABOUT 3-1/4 HR.</p> <p>C. ABORT DURING POWERED DESCENT WILL INSERT THE LM INTO ORBIT UTILIZING THE ONBOARD VARIABLE ABORT TARGETING. FOR ABORTS DURING THE FIRST 11 MIN, DOCKING SHOULD OCCUR WITHIN 3-1/4 HR. FOR ABORTS AFTER 11 MIN, DOCKING WILL OCCUR WITHIN 5-1/4 HR.</p> <p>D. FOR COMPLETE LM FAILURES PRIOR TO PDI, THE CSM WILL EXECUTE A 5-IMPULSE RESCUE WITH DOCKING IN ABOUT 7-1/4 HR FROM PDI.</p> <p style="margin-top: 20px;">RULE NUMBERS 3-44 THROUGH 3-48 ARE RESERVED.</p>														
<p>RULE NUMBERS 3-44 THROUGH 3-48 ARE RESERVED.</p>																
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>MISSION RULE SUMMARY</td> <td>LUNAR ORBIT</td> <td>3-9</td> <td style="text-align: right;">Tape 55.9</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR ORBIT	3-9	Tape 55.9
MISSION	REV	DATE	SECTION	GROUP	PAGE											
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MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM						
	3-49	<p style="text-align: center;"><u>POWERED DESCENT PHASE</u></p> <p><u>PDI IGNITION</u> - THE FOLLOWING ACTION WILL BE TAKEN:</p> <p>A. AUTO ULLAGE GOOD -IF NO AUTO DPS IGN, FLIGHT CREW PERFORM MANUAL DPS IGNITION</p> <p>B. NO AUTO ULLAGE -FLIGHT CREW BACK UP THE ULLAGE MANEUVER -IF NO AUTO DPS IGN FLIGHT CREW WILL NO-GO PDI</p>					
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR ORBIT DESCENT	3-10	Tape 55.10

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## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
	3-50	<p>LR DATA IS REQUIRED FOR LANDING</p> <p>A. LOCK ON</p> <ol style="list-style-type: none"> <li>1. LR DATA ACCEPTED AND CONVERGED CONTINUOUS TO P64 - <u>CONTINUE MISSION</u> IF LOSS OF LOCK OCCURS IN P64.</li> <li>2. LR DATA ACCEPTED AND CONVERGED WITH SUBSEQUENT DROPOUT - <u>CONTINUE INTO P64</u>.                             <ol style="list-style-type: none"> <li>(A) LANDING RADAR REGAINED IN P64                                     <ol style="list-style-type: none"> <li>(1) DATA ACCEPTED BY LGC - <u>CONTINUE MISSION</u></li> <li>(2) DATA NOT ACCEPTED BY LGC - <u>ATTEMPT MANUAL LANDING</u> IF LR/PGNS <math>\Delta H &lt; 1500</math> FT</li> </ol> </li> <li>(B) LANDING RADAR NOT REGAINED IN P64 - <u>ABORT</u></li> </ol> </li> <li>3. LATE LR LOCK-ON WITH DATA BEING INCORPORATED AND CONVERGING - <u>CONTINUE INTO P64</u>.                             <ol style="list-style-type: none"> <li>(A) DATA ACCEPTED BY LGC - <u>CONTINUE MISSION</u></li> <li>(B) DATA NOT ACCEPTED BY LGC - <u>ATTEMPT MANUAL LANDING</u></li> </ol> </li> </ol> <p>B. MINIMUM ALTITUDE WITHOUT LR ALTITUDE INCORPORATION</p> <ol style="list-style-type: none"> <li>1. PGNS ALTITUDE LESS THAN 22,000 FEET AND PGNS NAVIGATION ERRORS, CONFIRMED BY MSFN OR DOPPLER RESIDUALS, THAT CAUSE THE AGS-PGNS RADIAL VELOCITY DIFFERENCE                             <ol style="list-style-type: none"> <li>(A) RADIAL N69 NOT INCORPORATED AND DIFFERENCE EXCEEDS -10 FPS - <u>ABORT</u></li> <li>(B) RADIAL N69 INCORPORATED AND DIFFERENCE EXCEEDS -20 FPS - <u>ABORT</u></li> </ol> </li> <li>2. PGNS ALTITUDE LESS THAN 18,000 FEET AND PGNS NAVIGATION ERRORS, CONFIRMED BY DOPPLER BUT NOT BY AGS, THAT CAUSE THE MSFN-PGNS RADIAL VELOCITY DIFFERENCE TO EXCEED -20 FPS - <u>ABORT</u></li> <li>3. PGNS ALTITUDE LESS THAN 10,000 FEET                             <ol style="list-style-type: none"> <li>(A) RADIAL N69 NOT INCORPORATED - <u>ABORT</u></li> <li>(B) LOSS OF WORKING PGNS (AS DEFINED BY RULE 5-91) - <u>ABORT</u></li> </ol> </li> <li>4. PGNS ALTITUDE LESS THAN 6,000 FEET - <u>ABORT</u></li> </ol> <p style="text-align: center;"><u>NOTE</u> FOR FAILURES IN THE PGNS/LR INTERFACES, INCORPORATION MAY BE SATISFIED BY A PGNS/LR COMPARISON RESULTING IN A <math>\Delta H &lt; 1500</math> FT.</p> <p>C. MINIMUM ALTITUDE WITHOUT LR VELOCITY INCORPORATION</p> <ol style="list-style-type: none"> <li>1. PGNS ALTITUDE LESS THAN 10,000 FEET WITH LANDMARK TRACKING OBTAINED AND PGNS NAVIGATION ERRORS CONFIRMED BY AGS OR DOPPLER THAT CAUSE MSFN - PGNS DOWNRANGE OR CROSSRANGE VELOCITY DIFFERENCES                             <ol style="list-style-type: none"> <li>(A) NAV N69 INCORPORATED AND <math>\Delta \dot{X}</math> EXCEEDS +50 OR -35 FPS OR <math>\Delta \dot{Y}</math> EXCEEDS +90 OR -70 FPS - <u>ABORT</u></li> <li>(B) NAV N69 NOT INCORPORATED AND <math>\Delta \dot{X}</math> EXCEEDS <math>\pm 20</math> FPS OR <math>\Delta \dot{Y}</math> EXCEEDS +45 OR -25 FPS - <u>ABORT</u></li> </ol> </li> <li>2. PGNS ALTITUDE LESS THAN 10,000 FEET WITHOUT LANDMARK TRACKING OBTAINED AND PGNS NAVIGATION ERRORS CONFIRMED BY AGS OR DOPPLER THAT CAUSE MSFN - PGNS DOWNRANGE OR CROSSRANGE VELOCITY DIFFERENCES                             <ol style="list-style-type: none"> <li>(A) NAV N69 INCORPORATED AND <math>\Delta \dot{X}</math> EXCEEDS <math>\pm 35</math> FPS OR <math>\Delta \dot{Y}</math> EXCEEDS +70 OR -25 FPS - <u>ABORT</u></li> <li>(B) NAV N69 NOT INCORPORATED AND <math>\Delta \dot{X}</math> EXCEEDS <math>\pm 15</math> FPS OR <math>\Delta \dot{Y}</math> EXCEEDS +30 OR -10 FPS - <u>ABORT</u>.</li> </ol> </li> </ol>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR ORBIT DESCENT	3-11	Tape 55.11

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM															
	3-51	<p>POWERED DESCENT WILL BE TERMINATED FOR THE FOLLOWING:</p> <p>A. PGNS NAVIGATION ERRORS, CONFIRMED BY MSFN OR DOPPLER RESIDUALS, THAT RESULT IN THE FOLLOWING AGS-PGNS VELOCITY DIFFERENCES:</p> <p style="margin-left: 40px;"><math>\Delta\dot{X}</math> (DOWNRANGE) GREATER THAN +90 OR -35 FPS  <math>\Delta\dot{Y}</math> (CROSSRANGE) GREATER THAN <math>\pm 90</math> FPS  <math>\Delta\dot{Z}</math> (RADIAL) GREATER THAN +60 OR -35 FPS</p> <p>B. PGNS NAVIGATION ERRORS, CONFIRMED BY DOPPLER RESIDUAL BUT NOT BY AGS, THAT RESULT IN THE FOLLOWING MSFN-PGNS VELOCITY DIFFERENCES:</p> <p style="margin-left: 40px;"><math>\Delta\dot{Y}</math> (CROSSRANGE) GREATER THAN <math>\pm 200</math> FPS  <math>\Delta\dot{Z}</math> (RADIAL) GREATER THAN <u>+45</u> OR -35 FPS</p> <p>C. COMMANDED THRUST INCREASING PRIOR TO THROTTLE-DOWN OR P63 TGO = 80 SEC</p> <p>D. GTC GREATER THAN 57 PERCENT BY P63/64 PROGRAM SWITCH PLUS 15 SEC</p> <p>E. FAILURE TO ACHIEVE FTP (AUTO OR MANUAL) BY NOMINAL TIG PLUS 31 SEC. (ABORT AT GTC DIVERGENCE.)</p> <p>F. THE FOLLOWING PGNS ALARMS: 20105, 00214, 20430, 20607, 21103, 20607, 21103, 01107, 21204, 21302, 21501, 00402 (CONTINUING)</p> <p>G. VIOLATION OF THE TIME BIASED DPS ABORT BOUNDARY</p> <p>H. NO THROTTLE RECOVERY (AUTO OR MANUAL) WITHIN 40 SEC AFTER GTC EQUALS 57 PERCENT</p>														
	3-52	AN ABORT WILL NOT BE PERFORMED FOR PGNS FAILURE AFTER OBTAINING PITCHOVER IN THE APPROACH PHASE.														
	3-53	<p>THE DESCENT TARGET POINT WILL BE SHIFTED DOWNTRACK IF GTC INDICATES NO THROTTLEDOWN BY P63/64 PROGRAM SWITCH. THE MAXIMUM SHIFT IS AS FOLLOWS:</p> <p>A. 20,000 FT DOWNTRACK IF VALID LANDMARK SIGHTINGS WERE OBTAINED.</p> <p>B. 10,000 FT DOWNTRACK IF NO VALID LANDMARK SIGHTINGS WERE OBTAINED.</p> <p>C. NO DOWNTRACK SHIFT WILL BE ALLOWED IF THE APPROACH AZIMUTH IS BETWEEN 95 AND 100 DEGREES.</p> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">ONE MINUTE OF RCS WILL BE USED TO ALLOW LANDING WITHIN THE ABOVE LIMITS.</p>														
	3-54	<p>IN THE EVENT MSFN AND DOPPLER DATA ARE NOT AVAILABLE FOR CONFIRMATION OF PGNS/AGS ERRORS, POWERED DESCENT WILL BE TERMINATED FOR THE FOLLOWING AGS-PGNS VELOCITY DIFFERENCES:</p> <p style="margin-left: 40px;"><math>\Delta\dot{X} &gt; -35</math> FPS  <math>\Delta\dot{Z} &gt; +60</math> OR -35 FPS</p>														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">MISSION</th> <th style="width: 5%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 25%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>MISSION RULE SUMMARY</td> <td>POWERED DESCENT</td> <td>3-12</td> <td style="text-align: right;">Tape 50.7</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	POWERED DESCENT	3-12	Tape 50.7
MISSION	REV	DATE	SECTION	GROUP	PAGE											
APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	POWERED DESCENT	3-12	Tape 50.7										

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
	3-55	<p>IN THE EVENT MSFN, DOPPLER, AND AGS NAV DATA ARE NOT AVAILABLE FOR MONITORING OF POWERED DESCENT, AN ABORT WILL BE PERFORMED IF LR DATA IS NOT INCORPORATED INTO THE PGNS BY PDI + 7 MIN.</p> <p>RULE NUMBERS 3-56 THROUGH 3-61 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	POWERED DESCENT	3-13	Tape 50.8

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
	3-62	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: fit-content;">LUNAR SURFACE EVA PHASE</div>						
		<p>INITIATION/TERMINATION/CURTAILMENT</p> <p>A. AFTER START OF A DRIVING TRAVERSE, THE TIMELINE WILL BE OPTIMIZED TO REMAIN WITHIN THE LRV DRIVING CAPABILITY TO RETURN TO THE LM.</p> <p>B. IF LRV MOBILITY IS DEGRADED, THE FOLLOWING WILL BE EVALUATED TO ACCOMPLISH MAXIMUM SCIENTIFIC RETURN:</p> <ol style="list-style-type: none"> <li>1. TRAVERSE DISTANCE</li> <li>2. TIME AT EACH STOP</li> <li>3. DELETION OF STOPS</li> </ol> <p>C. THE LRV WILL BE UTILIZED BECAUSE OF ITS SCIENCE AND EQUIPMENT PAYLOAD CAPABILITY AND ITS ABILITY TO REDUCE METABOLIC RATES IF ITS SPEED IS APPROXIMATELY THE AVERAGE WALKING SPEED.</p> <p>D. FOR EVA TERMINATION OR OTHER INTERRUPTIONS DURING ALSEP DEPLOYMENT, THE FOLLOWING PREFERRED DEPLOYMENT INTERRUPTION POINTS WILL BE OBSERVED IF PERMITTED BY CREW SAFETY CONSIDERATION:</p> <ol style="list-style-type: none"> <li>1. REMOVE ALSEP PACKAGES 1 AND 2. CLOSE SEQ BAY DOOR. EMLACE ALSEP PACKAGES WITH HANDLES UP AND EXPERIMENTS IN AND FACING THE SUN WITHIN <math>\pm 15^\circ</math>.</li> <li>2. TILT FUEL CASK. DOME NOT REMOVED.</li> <li>3. TILT FUEL CASK. REMOVE DOME. DO NOT DEFUEL.</li> <li>4. FUEL RTG. CARRY ALSEP TO DEPLOYMENT SITE. REMOVE ALL COMPONENTS FROM PACKAGE 2. CARRY PACKAGE 1 TO EMLACEMENT SITE. DO NOT CONNECT RTG CABLE TO C/S UNLESS SUFFICIENT TIME IS AVAILABLE TO ERECT THE CS SUNSHIELD.</li> <li>5. CONNECT HFE AND LEAM CABLES TO C/S. REMOVE LSP, LSG, AND LMS FROM SUBPACKAGE 1. ALIGN C/S AND RAISE SUNSHIELD. MOUNT ANTENNA MAST, GIMBAL, AND ANTENNA. LEVEL AND ALIGN ANTENNA. DEPRESS SHORTING PLUG ON WAY BACK TO LM.</li> <li>6. THE HFE CAN BE INTERRUPTED AFTER COMPLETION OF THE FIRST PROBE HOLE.</li> <li>7. DEPLOY ALSEP EXPERIMENTS AND COMPLETE TASKS. A HOLD POINT EXISTS AFTER EACH TASK IS COMPLETED. DEPRESS SHORTING PLUG SWITCH ON WAY BACK TO LM (SEE CONTINGENCY PROCEDURES FOR HOLD POINTS).</li> </ol> <p>E. IN REPLANNING THE LRV TRAVERSES BETWEEN EVA'S, BATTERY THERMAL MANAGEMENT TECHNIQUES WILL BE SCHEDULED AS NECESSARY TO KEEP THE PREDICTED LRV BATTERY TEMPS BETWEEN <math>40^\circ</math> F AND <math>125^\circ</math> F ON EVA'S 1 AND 2, AND BETWEEN <math>40^\circ</math> F AND <math>140^\circ</math> F ON EVA 3.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR SURFACE EVA PHASE	3-14	Tape 60.4

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## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
	3-63	<p>PRECEDENCE/SCHEDULING GUIDELINES</p> <p>A. FOR ANY MALFUNCTION ON A SURFACE TASK, A MAXIMUM OF 10 MINUTES WILL BE SPENT ON THE CONTINGENCY PROCEDURE BEFORE THE TASK IS ABANDONED, WITH THE FOLLOWING EXCEPTIONS:</p> <ol style="list-style-type: none"> <li>1. RTG FUELING - UP TO 20 MINUTES WILL BE ALLOWED IN EXERCISING RTG FUELING CONTINGENCY PROCEDURES.</li> <li>2. ALSEP PACKAGE 1 TO PACKAGE 2 CABLE CONNECTIONS - UP TO 20 MINUTES WILL BE ALLOWED FOR MAKING THE CABLE CONNECTION.</li> <li>3. ALSEP ANTENNA - UP TO 30 MINUTES WILL BE ALLOWED FOR ANTENNA ERECTION AND ALIGNMENT.</li> <li>4. LRV ANOMALIES - UP TO 10 MINUTES WILL BE ALLOWED FOR ISOLATING MALFUNCTIONS. UP TO 30 MINUTES WILL BE ALLOWED TO RECOVER UTILIZATION OF THE VEHICLE.</li> <li>5. ALSEP DEPLOYMENT MAY BE CONTINUED ON A LATER EVA IF ADDITIONAL TIME TO SPEND ON CONTINGENCY PROCEDURES IS REQUIRED TO ATTAIN AN OPERATIONAL ALSEP.</li> </ol> <p>B. IF A TASK IS NOT ABANDONED AND IS LEFT INCOMPLETE AT THE END OF AN EVA, IT WILL BE SCHEDULED DURING A SUBSEQUENT EVA CONSISTENT WITH ITS RANK WITHIN THE PRIORITIES DEFINED.</p> <p>C. ALSEP DEPLOYMENT WILL NOT BE STARTED IF IT IS KNOWN THAT LESS THAN <u>1 HR 30 MIN</u> IS AVAILABLE FOR ALSEP IN EVA 1.</p>						
	3-64	<p>LRV SYSTEMS/NAVIGATION</p> <p>A. THERE ARE NO MINIMUM LRV SYSTEMS REQUIREMENTS WHICH WOULD CAUSE ABANDONMENT OF THE LRV IF THE CREW EVALUATES THE FOLLOWING AS ACCEPTABLE:</p> <ol style="list-style-type: none"> <li>1. MOBILITY AND CONTROL</li> <li>2. TRAVERSE RATE IS AT LEAST APPROXIMATELY EQUAL TO WALKING RATE</li> <li>3. REDUNDANT LIFE SUPPORT CAPABILITY FOR LM RETURN</li> </ol> <p>B. WITH A NONOPERATIONAL LRV NAVIGATION SYSTEM, ONE OF THE FOLLOWING RETURN TRAVERSE CAPABILITIES IS REQUIRED TO INITIATE OR CONTINUE A TRAVERSE:</p> <ol style="list-style-type: none"> <li>1. REASONABLE VISUAL ACCESS OF THE LM</li> <li>2. REASONABLE VISUAL ACCESS OF THE OUTBOUND TRAVERSE PATH</li> <li>3. SUN RELATIVE BEARING TO THE LM</li> </ol> <p>C. CONTINGENCY POWER/THERMAL MANAGEMENT AND/OR TRAVERSE ADJUSTMENT MUST BE EXERCISED TO KEEP THE LRV BATTERY TEMPERATURE BELOW 125° F ON EVA'S 1 AND 2 AND 140° F ON EVA 3. EXCEEDING THIS LIMIT WILL RESULT IN AN UNPREDICTABLE DEGRADATION OF BATTERY PERFORMANCE AND NAVIGATION ELECTRONICS.</p> <p>D. THE LRV WILL NOT BE ABANDONED BECAUSE OF EXCESSIVE BATTERY TEMPERATURE(S).</p>						
			MISSION	REV	DATE	SECTION	GROUP	PAGE
			APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR SURFACE EVA PHASE	3-15
								Tape 60.5

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
	3-65	<p>COMMUNICATIONS/TV</p> <p>A. THE FOLLOWING COMM CAPABILITY IS REQUIRED TO START AND CONTINUE A TRAVERSE:</p> <ol style="list-style-type: none"> <li>1. MSFN VOICE UPLINK TO ONE CREWMAN, AND VOICE DOWNLINK FROM ONE CREWMAN OR TV (FOR MONITORING CREW RESPONSE).</li> <li>2. MONITOR STATUS OF EMU CRITICAL PARAMETERS (MSFN OR CREW).</li> <li>3. LOSS OF COMM WILL BE ACCEPTABLE DURING LRV MOVING OPERATIONS IF MINIMUM COMM REQUIREMENTS CAN BE MET AT THE NEXT STOP. THE MAXIMUM ALLOWABLE CONTINUOUS LOSS OF COMM WOULD BE APPROXIMATELY 30 MIN.</li> </ol> <p>B. IF LCRU PROBLEMS OCCUR, VOICE AND TM HAVE PRIORITY OVER TV.</p> <p style="text-align: center;"><u>NOTE</u> GCTA TV IS NOT AVAILABLE IN THE HAND-CARRY MODE.</p> <p>C. GCTA OPERATIONS</p> <ol style="list-style-type: none"> <li>1. THE COLOR TV CAMERA WILL NOT BE POINTED SUCH THAT THE SUN WILL BE IN THE FIELD OF VIEW. THE CAMERA MAY BE POINTED NEAR THE SUN. HOWEVER, IF OBJECTIONABLE FLARE OCCURS, THE GROUND WILL REQUEST THE CAMERA BE MOVED OR WILL MOVE THE CAMERA VIA GROUND COMMANDS.</li> <li>2. THE GROUND WILL MONITOR THE TV PICTURE AND RECOMMEND OR COMMAND CAMERA MOVEMENT TO PREVENT IRREVERSIBLE VIDICON TUBE BURNS FROM REFLECTIVE OBJECTS.</li> <li>3. BETWEEN EVA'S, THE TV CAMERA WILL BE LOCATED IN THE SUN AND WILL BE OFF TO MAINTAIN THERMAL BALANCE.</li> <li>4. WHEN A BRIGHT OBJECT WITH A CONTRASTING DARK BACKGROUND IS IN THE FIELD OF VIEW, THE GROUND WILL RECOMMEND OR COMMAND AN ALC SWITCH SETTING TO GET THE BEST PICTURE. THE ALC-PEAK WILL GIVE THE BEST PICTURE OF THE BRIGHT OBJECT, AND THE ALC-AVERAGE WILL GIVE THE BEST PICTURE OF THE DARK BACKGROUND.</li> </ol>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR SURFACE EVA PHASE	3-16	Tape 55.12

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## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
	3-66	<p><u>ALSEP</u></p> <p>A. ALSEP SHORTING PLUG SWITCH WILL BE ACTIVATED ASAP AFTER CENTRAL STATION DEPLOYMENT.</p> <p>B. IF THE GROUND IS UNABLE TO OBTAIN DOWNLINK, THE GROUND WILL REQUEST THE ASTRONAUT TO ROTATE THE RESET POWER SWITCH CW AND THEN CCW.</p> <p>C. IF THE CREW MUST RETURN TO THE LM PRIOR TO COMPLETE ALSEP DEPLOYMENT, THE SHORTING PLUG SWITCH WILL BE ACTIVATED "ON" IF THE ANTENNA IS EMPLACED. IF THE ANTENNA IS NOT EMPLACED, THIS SWITCH WILL NOT BE ACTIVATED (PICK UP HERE ON EVA 2).</p> <p>D. THE HFE WILL HAVE PRIORITY OVER DRILL CORE STEM. THE HFE BORE HOLES WILL BE ATTEMPTED FIRST. IF PROBLEMS ARE ENCOUNTERED, EFFORTS ON BORE HOLES WILL BE TERMINATED AFTER A TOTAL OF 20 MIN ACCUMULATED DRILL ON TIME.</p> <p>E. IF A HARD OBJECT IS ENCOUNTERED WHICH REDUCES DRILL RATE TO LESS THAN <u>5</u> INCHES PER MINUTE ON EITHER HFE PROBE HOLE, THE FOLLOWING WILL BE ACCOMPLISHED:</p> <ol style="list-style-type: none"> <li>1. IF THE SECOND STEM SECTION IS NOT ATTACHED, WITHDRAW AND START AT A DIFFERENT LOCATION FOR MAXIMUM OF TWO WITHDRAWALS.</li> <li>2. IF SECOND STEM IS ATTACHED, CONTINUE UNTIL <u>10</u> MINUTES OF POWER "ON" TIME FOR THE DRILL STRING HAS ELAPSED.</li> </ol> <p>F. IF UNABLE TO DRILL NORMAL HFE BORE HOLES, THE FOLLOWING SHOULD BE ACCOMPLISHED:</p> <ol style="list-style-type: none"> <li>1. ATTEMPT TO INSERT PROBE INTO LUNAR SUBSURFACE USING HAND-AUGER, DOUBLE CORE TUBE HOLE, OR TRENCH METHODS, IN THAT ORDER.</li> <li>2. IF BORE HOLE IS AT LEAST 24 INCHES DEEP, PLACE PROBE IN HOLE AS FAR AS IT WILL GO.</li> </ol> <p>G. THE LSG WILL BE RECHECKED FOR LEVEL AND ALIGNMENT AND READINGS REPORTED BY THE ASTRONAUT AFTER EXPERIMENT UNCAGING. IF OUTSIDE <math>\pm 3^\circ</math> AZ, <math>\pm 3^\circ</math> LEVEL, THE LSG WILL BE RELEVELLED AND REALIGNED.</p> <p>H. THE LSP CHARGES WILL BE DEPLOYED WITHIN LINE-OF-SIGHT OF THE LSP TRANSMITTING ANTENNA AND IN AN AREA WHERE THE CHARGE WILL HAVE UNIFORM CONTACT WITH THE LUNAR SURFACE.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR SURFACE EVA PHASE	3-17	Tape 51.1

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MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
	3-67	<p><u>GEOPHYSICS EXPERIMENTS</u></p> <p>A. IF THE TRAVERSE GRAVIMETER EXHIBITS A PHASE LOCK LOOP ALARM WHILE A READING IS TAKEN ON THE LRV, SUBSEQUENT READINGS WILL BE TAKEN ON THE SURFACE. IF THE PHASE LOCK LOOP ALARM OCCURS WHEN A READING IS TAKEN ON THE SURFACE, THE PHASE LOCK LOOP WILL BE BY-PASSED.</p> <p>B. IF THE TGE MEASUREMENTS INDICATE DEVIATION OF PRECISION OVEN TEMPERATURES, READINGS WILL BE CONTINUED UNTIL THE TEMPERATURES ARE OFF SCALE. IF THE TGE INTERMEDIATE OVEN READING ON EVA 1 INDICATES A HOT ALARM PRIOR TO THE TRAVERSE, IT WILL BE LEFT IN THE LM SHADOW WITH THE RADIATOR EXPOSED.</p> <p>C. IF THE VIBRATING STRING AMPLIFIER SIGNAL IS LOST THE TGE WILL BE ABANDONED (REFERENCE MSN RULE 31-109, 110).</p> <p>D. SEP EXPERIMENT THERMAL CONTROL WILL BE ACCOMPLISHED BY OPENING OR CLOSING OF THE RADIATOR COVERS, BRUSHING DUST FROM THE RADIATOR SURFACES, AND TURNING THE DSEA TAPE CASSETTE OFF AT TRAVERSE STOPS GREATER THAN <u>30</u> MINUTES, OR BY TURNING THE POWER CONTROL TO STBY.</p> <p>E. SEP RADIATOR SURFACES WILL BE DUSTED:</p> <ol style="list-style-type: none"> <li>1. PRIOR TO EACH COOL-DOWN PERIOD.</li> <li>2. AT EACH TRAVERSE STOP AT WHICH THE COVERS ARE OPEN.</li> </ol> <p>F. IF THE NEUTRON FLUX MONITOR DOES NOT HAVE THE DRILL CORE HOLE AVAILABLE OR ENCOUNTERS DIFFICULTY IN PENETRATING THE CORE HOLE, ALTERNATE METHODS WILL BE USED TO IMPLACE THE MONITOR TO A MINIMUM DEPTH OF <u>18</u> INCHES.</p> <p>RULE NUMBERS 3-68 THROUGH 3-79 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	LUNAR SURFACE EVA PHASE	3-18	Tape 51.2

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MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM							
		<u>ASCENT</u>						
	3-80	<p>ASCENT</p> <p>A. GUIDANCE SWITCHOVER TO AGS WILL BE PERFORMED FOR:</p> <ol style="list-style-type: none"> <li>1. THE FOLLOWING PGNS ALARMS: 20105, 00214, 20430, 20607, 21103, 01107, 21204, 21302, AND 21501.</li> <li>2. CONFIRMED PGNS NAVIGATION ERRORS (DURING ASCENT OR FOLLOWING DESCENT ABORT) THAT RESULT IN ANY OF THE FOLLOWING CONDITIONS:                             <ol style="list-style-type: none"> <li>(A) AGS PREDICTED <math>H_p</math> AT INSERTION LESS THAN 40,000 FT</li> <li>(B) AGS PREDICTED <math>H_a</math> AT INSERTION GREATER THAN TARGET VALUE PLUS 40 NM</li> <li>(C) AGS PREDICTED INSERTION WEDGE ANGLES GREATER THAN 1.0 DEG (DESCENT ABORT CASE OR COELLIPTIC SEQ RNDZ) OR GREATER THAN 0.5 DEG (DIRECT RNDZ)</li> </ol> </li> <li>3. CONFIRMED PGNS NAVIGATION ERRORS THAT RESULT IN THE FOLLOWING MSFN PGNS VELOCITY DIFFERENCES:                             <ol style="list-style-type: none"> <li>(A) DELTA <math>V_x</math> (DOWN RANGE) GREATER THAN <math>\pm 24</math> FPS</li> <li>(B) DELTA <math>V_y</math> (CROSS RANGE) GREATER THAN <math>\pm 90</math> FPS (COELLIPTIC SEC RNDZ) OR GREATER THAN <math>\pm 45</math> FPS (DIRECT RNDZ)</li> <li>(C) DELTA <math>V_z</math> (RADIAL) GREATER THAN <math>\pm 37</math> FPS</li> </ol> </li> </ol> <p>B. THE GROUND WILL NOT REQUEST SWITCHOVER AFTER AGS TGO LESS THAN 30 SECONDS.</p> <p>C. DURING ASCENT, THE AGS WILL BE DECLARED NO-GO IF CONFIRMED AGS NAVIGATION ERRORS RESULT IN:</p> <ol style="list-style-type: none"> <li>1. PGNS PREDICTED INSERTION <math>H_p</math> LESS THAN 30,000 FT</li> <li>2. PGNS PREDICTED INSERTION <math>H_a</math> GREATER THAN TARGET VALUE PLUS 40 NM</li> <li>3. PGNS PREDICTED INSERTION WEDGE ANGLE GREATER THAN 1.0 DEG (COELLIPTIC SEQ RNDZ) OR GREATER THAN 0.5 DEG (DIRECT RNDZ)</li> </ol>						
	3-81	<p>REQUIREMENTS TO COMMIT TO THE SHORT RNDZ</p> <p>A. PRIOR TO L/O THE FOLLOWING IS REQUIRED:</p> <ol style="list-style-type: none"> <li>1. ONE OPERATIONAL LM NAVIGATION SYSTEM</li> <li>2. PREDICTED WEDGE ANGLE AT INSERTION EQUALS ZERO DEGREES.</li> <li>3. NO VIOLATION OF THE NAVIGATION REQUIREMENTS (REFERENCE MATRIX PAGE 3-20)</li> </ol> <p>B. AT INSERTION (PRE-TWEAK) THE FOLLOWING IS REQUIRED:</p> <ol style="list-style-type: none"> <li>1. TWEAK <math>\Delta V</math> LESS THAN 60 FPS</li> <li>2. POST-TWEAK <math>H_p</math> GREATER THAN 5 NM</li> <li>3. NO VIOLATION OF THE NAVIGATION REQUIREMENTS (REFERENCE MATRIX PAGE 3-20)</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">WITH THE EXCEPTION OF LM COMPUTERS AND INERTIAL REFERENCES, NO ONBOARD NAVIGATION SYSTEMS ARE VERIFIED AFTER LIFT-OFF.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	ASCENT EVA PHASE	3-19	/ Tape 51.3

NASA - Manned Spacecraft Center

MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM	REQUIRED G&N SYSTEMS NEEDED FOR DIRECT RNDZ					
		PRIMARY RNDZ NAVIGATION TECHNIQUE	SYSTEM REQUIREMENTS				
			COMPUTER	SENSOR/OPTICS	SENSOR/COMPUTER INTERFACE SUPPLYING	TRACKER LIGHT	PLATFORM
		LGC/RR	LGC	RNDZ RADAR	RANGE, RANGE RATE, SHAFT AND TRUNION ANGLES		IMU
		AGS/RR	AEA	RNDZ RADAR LM COAS	TAPEMETER: RANGE AND RANGE RATE	CSM	ASA
		CMC/SXT	CMC	USEABLE SXT	SXT SHAFT AND TRUNNION ANGLES	LM	IMU
<p>1. DIRECT RNDZ IS GO AS LONG AS ANY ONE OF THESE TECHNIQUES REMAINS AVAILABLE.</p> <p>2. LOSS OF ALL THREE OF THESE TECHNIQUES WILL RESULT IN EXECUTION OF THE COELLIPTIC SEQUENCE RNDZ.</p>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	ASCENT EVA PHASE	3-20
							Tape 10.3

NASA - Manned Spacecraft Center

MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM						
		<u>TRANSEARTH COAST</u>					
	3-82	TRANSEARTH MCC NOMINAL EXECUTION POINTS WILL BE AT THE FOLLOWING:					
		A. TEI + 17 HOURS					
		B. EI - 22 HOURS					
		C. EI - 3 HOURS					
	3-83	TRANSEARTH MCC PHILOSOPHY:					
		THE G&N IS THE PRIMARY MODE OF EXECUTION FOR ALL TEC MCC'S.					
	3-84	CSM EVA					
		ATTITUDE/RATES CONSTRAINTS:					
		THE SUN LOOK ANGLES WILL BE MAINTAINED AT THETA 145 DEGREES, PHI 315 DEGREES ±5 DEGREES.					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	ASCENT EVA PHASE	3-21
		Tape 10.4					



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## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM	ENGINE LIMITS		RATES/ERRORS FOR		MANUAL START ACTION	OVERBURN SHUTDOWN CRITERIA	EARLY C/O RESTART CRITERIA	RCS TRIM GUIDELINES	
		INHIBIT	TERMINATE	TAKEOVER	ACTION					
		MODE III	NONE	ERRATIC ENG	5/5	COMPLETE	START	g	Hp > 40	N/A
		MODE IV	NONE	ERRATIC ENG	5/5	COMPLETE	START	g	Hp < 95 IF G&N GO ΔVTG > 60 OR C/O > 6 SEC EARLY	N/A
		APOGEE KICK	NONE	ERRATIC ENG	5/5	COMPLETE	START	g	Hp < 95 IF G&N GO ΔVTG > 60 OR C/O > 6 SEC EARLY	N/A
		TLC MCC	TIGHT <sup>f</sup>	TIGHT <sup>i</sup>	10/10	TERMINATE	DELAY	1 SEC	NO	X = 0.2 <sup>b</sup>
		LOI	TIGHT <sup>h</sup>				START <sup>1</sup>			NO
		MODE I								
		0 TO 0 + 53		TIGHT	10/10	COMPLETE			YES	
		0 + 53 TO 1 + 31		LOOSE	10/10	COMPLETE			YES	
		MODE II								
		1 + 31 TO 2 + 54		LOOSE	10/10	COMPLETE			YES	
		MODE III <sup>c</sup>								
		2 + 54 TO 3 + 40		LOOSE	10/10	COMPLETE			YES	
		3 + 40 TO C/O		TIGHT <sup>h</sup>	10/10	COMPLETE		10 SEC	VGO > 50 AND G&N GO	
		DOI <sub>1</sub>	TIGHT <sup>f</sup>	TIGHT <sup>f</sup>	10/10	TERMINATE	DELAY	BT	NO	J
		CIRC	TIGHT <sup>f</sup>	TIGHT	10/10	TERMINATE	START	1 SEC	ΔV TO GO > 20	ALL = 0.2
		RESCUE	LOOSE	LOOSE	10/10	COMPLETE	START	1 SEC	ΔV TO GO > 12	ALL = 0.2
		LOPC	TIGHT <sup>f</sup>	TIGHT	10/10	TERMINATE	DELAY	1 SEC	NO	Y = 0.2
		TEI (G&N)	NONE	NONE	10/10	COMPLETE	DELAY	2 SEC AND ΔV <sub>C</sub> = -40 <sup>c</sup>	C/O > 3 SEC EARLY AND ΔV <sub>C</sub> > 50 <sup>c</sup>	X AND Z = 0.2
		TEI (SCS)	NONE	NONE	10/10	COMPLETE	START	2 SEC	ΔV <sub>C</sub> > 50 OR C/O > 5 SEC EARLY	NO
		TEC MCC								
		CORRIDOR	LOOSE	LOOSE	10/10	COMPLETE	DELAY	1 SEC AND ΔV <sub>C</sub> = 0	NO	X = 0.2
		IP CONTROL <sup>b</sup>	TIGHT	TIGHT	10/10	TERMINATE	DELAY	1 SEC AND ΔV <sub>C</sub> = 0	NO	X AND Z = 0.2
		TLC ABORT	TIGHT	LOOSE	10/10	COMPLETE	START	10 SEC AND ΔV <sub>C</sub> = -70	C/O > 10 SEC EARLY AND ΔV <sub>C</sub> > 70	NO
		EARTH DEOB	TIGHT <sup>d</sup>	LOOSE	10/10	COMPLETE	START	1 SEC AND ΔV <sub>C</sub> = 0	ΔV TO GO > 30 AND C/O > 3 SEC EARLY <sup>e</sup>	ALL = 0.2

**TIGHT LIMITS:** Fuel Ox ΔP > 20 and low P<sub>C</sub>; either prop tank press < 160 psi and low P<sub>C</sub>; P<sub>C</sub> < 80 or decays 10 psi and V<sub>M</sub> vs BT low; inhibit burn for any leak in He or prop tank. (Certain burns may be allowed with He tank leak if blowdown ΔV exceeds remaining mission requirements)<sup>f</sup>; GN<sub>2</sub> A or B < 400 psi (for LOI only, GN<sub>2</sub> A and B < 400 psi).  
**LOOSE LIMITS:** P<sub>C</sub> < 70 psi and other cues; either prop tank < 115 psi and low P<sub>C</sub>; erratic engine (popping, vibration, etc.)<sup>f</sup>.

**NOTES:** a. Reserved.  
 b. Trim all MCC (except MCC4) only if X ≤ 2 fps.  
 c. See Rule 5-131.  
 d. If SM RCS deorbit not available, use loose limits.  
 e. See Rule 5-27.  
 f. Some limits may be downgraded if warranted by mission circumstance.  
 g. See Rule 5-3.  
 h. If indication of ball valve failure, start on good bank (with LM available). If thrusting, shut down good bank 10 sec prior to nominal cutoff to verify indication.  
 i. If indication of ball valve failure, start on suspect bank. For dual bank burns, if indication of ball valve failure while thrusting, shut down good bank to verify failure. If thrusting continues, reenable good bank.  
 j. See Rule 3-39.  
 k. Reserved.  
 l. Ignition may be delayed up to but no more than 120 sec.

MISSION	REV	DATE	SECTION	GROUP	PAGE
APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	MANEUVERS EVA PHASE	3-23

SATURN LAUNCH VEHICLE GO/NO-GO CRITERIA  
9/1/72

REV	GO/NO-GO ITEM CONDITION	EARTH PARKING ORBIT		
		LAUNCH ABORT/SEPARATION	S-II/S-IVB EARLY STAGE	GUIDANCE TAKEOVER
				RESTART/TLI INHIBIT
				RESTART/TLI TERMINATE
S-IC	LOSS OF THRUST ANY 2 ENG	PRIOR TO TB1 + 2:00 - AUTO ABORT		
	LOSS OF THRUST 2 ADJ ENG	BETWEEN TB1 +2:00 AND TB2 +0:08 SEC-MANUAL ABORT		
	Q BALL + 5° ATT ERROR	MANUAL ABORT		
	4°/SEC P AND Y, 20°/SEC R	AUTO ABORT TO 2 + 00		
	10°/SEC P AND Y, 20°/SEC R	MANUAL ABORT AFTER 2 + 00		
II	LOSS OF ATTITUDE CONTROL	ABORT (LAUNCH)	IF SMALL RATES UP STAGE	ATTEMPT S/C CONTROL TB5 AND TB7 TO TB7 + 1.5 MIN
	INERTIAL ATTITUDE REFERENCE FAIL			LAUNCH, EPO TLI
S-II	LOSS OF THRUST (2 ENG).			
	LOSS OF THRUST (3 OR MORE ENG) ABORT IF PRIOR TO S-IVB TO COI	ABORT	AFTER S-IVB TO COI	
	ACTUATOR HARDOVER INBOARD	PRIOR TO S-IVB TO COI - ABORT	AFTER S-IVB TO COI AND BEFORE S-II C/O MINUS 30 SEC	
	2ND PLANE SEPARATION FAIL	BEFORE TB3 + 1 MIN 45 SEC - ABORT		
	Y DEVIATION > 20°	ABORT		
S-IVB	LOSS OF THRUST	PRIOR TO EPO - SEPARATE		
	LOSS OF HYDRAULIC FLUID PRIOR TO START	INHIBIT START		
	COLD HE FAIL OPEN	ABORT PRIOR TO S-II IGN	AFTER S-II IGN	
	INSUFFICIENT PROPELLANT			
	LOX VLV FAILS TO CLOSE AT 1ST C/O			
	DESTRUCT SYSTEM ARMS INADVERTANTLY			
	FL/OX BULKHEAD AP EXCEEDS LIMITS	SEP TO 7000 FT MINIMUM		
	START BOTTLE PRESS OUTSIDE RESTART LIMITS	-26 OR + 36 PSID (ANY TIME)	SEP TO 7000 FT MINIMUM	
	LOX CHILLDOWN FAIL	SEP > 1800 PSIA		
	S-IVB ACTUATOR HARDOVER	NO START		
	Y DEVIATION > 20°	ABORT		
				INHIBIT TLI DURING TB5 AND TB6
				INHIBIT RESTART
				INHIBIT RESTART
				-26 OR + 36 PSID (ANY TIME) SEP TO 7000 FT MINIMUM
				SEP > 1800 PSIA
				FOR LOX LEAD > 20 SEC - INHIBIT
				ANYTIME PRIOR TO IGN
				TLI TERMINATE
				TLI TERM DURING BURN CREW OPTION AFTER TB7 + 1.5

① DISREGARD Q BALL FOR ENGINE OUT PRIOR TO 75 SEC.

LEGEND:

NO REQUIREMENT



CSM GMC GO CRITERIA

9/1/72

GO/NO-GO ITEM	EARTH ORBIT		TLC		LUNAR ORBIT (BEFORE UNDOCKING)		UNDOCK	CIRC/DOI <sub>2</sub>	POWERED DESCENT		LUNAR STAY		LUNAR ORBIT (P-RNDZ)	POST DOCK	TEC
	CONT BOOST	ED	TD&E	CONT TLC	LOI	CONT LOI			CONT DOI <sub>1</sub>	PDI	PDI TO TD	PAST T1			
GNC/S CS															
DEORBIT CAPABILITY															
AUTO ATTITUDE CONTROL															
RATE DAMPING															
DIRECT RCS															
BMAGS P.Y															
BMAGS R															
FDAI															
THC															
RHC															
EMS															
CMC															
ISS															
OSS															
OPTICS DAC															
NO SOLENOID DR GND															
TVC SERVO LOOP															
DSKY															
FU/OX TANK (W/O LEAK)															
GN2 TANK (W/O LEAK)															
BALL VALVE BANK															
FEEDLINE TEMP >40° F															
FU/OX AP <20 PSI															
Pt. >70 PSI															
FLANGE TEMP <480°															
HE TANK (W/O LEAK)															
SM RCS															
HE TANK (W/O LEAK)															
NO LEAK BELOW ISO VLV															
PKG TEMP >55°															
THRUSTERS															
CM RCS															
HE TANK (W/O LEAK)															
MANIFOLD (W/O LEAK)															
NOT ARMED															

LEGEND:

- ① REQUIRES 3 AXIS ATTITUDE CONTROL AND TRANSLATION 3 AXIS (ONE LATERAL AXIS MAY BE DEGRADED)
- ② MUST HAVE SUFFICIENT BLOWDOWN FOR DEORBIT
- ③ AUTO OR MANUAL IN 3 AXIS
- ④ REQUIRES C1 OR D1, C2 OR D2, C3, C4, D3, D4 THRUSTERS
- ⑤ 3 AXIS ATT. CONTROL AND ± X TRANSLATION
- ⑥ 3 OF 4 TOTAL REQUIRED, ROLL 90° IF NECESSARY TO KEEP REDUNDANCY IN YAW
- ⑦ CONSIDERATION WILL BE GIVEN TO PERFORMING THE EVA WITH A PROPELLANT LEAK
- ⑧ NEITHER TANK REQUIRED IF SUFFICIENT BLOWDOWN EXISTS IN EACH RING FOR ENTRY. ARMING SYSTEM WITH SOURCE PRESS >1250 PSI WILL PROVIDE >60 LBS BLOWDOWN IN EACH RING
- ⑨ SINGLE POINT FAILURES WHICH CAN ONLY BE CONFIRMED BY BURNING ENGINE
- ⑩ CONSIDERATION WILL BE GIVEN TO COMPLETING THE LUNAR STAY PHASE



LM CONTROL MISSION RULES

9/1/72

DEFINITIONS

GUIDANCE AND CONTROL

- 3-AXIS ATTITUDE CONTROL--THE ABILITY TO CHANGE THE EXISTING VEHICLE ATTITUDE PLUS AND MINUS ABOUT EACH AXIS. TO HAVE THIS CAPABILITY, THE LM REQUIRES AN OPERATIONAL MANUAL OR AUTOMATIC CONTROL SYSTEM.
- REDUNDANT 3-AXIS ATTITUDE CONTROL--TWO AUTONOMOUS 3-AXIS ATTITUDE CONTROL SYSTEMS INDEPENDENT OF SECONDARY COILS, I.E., NO SINGLE FAILURE WILL CAUSE LOSS OF BOTH AUTONOMOUS SYSTEMS.
- GUIDANCE STEERING--ABILITY TO CALCULATE AND STEER THE LM ALONG THE DESIRED THRUST VECTOR DURING A POWERED MANEUVER. THIS CAPABILITY REQUIRES AN OPERATIONAL PGNS OR AGS INCLUDING A 3-AXIS ATTITUDE CONTROL SYSTEM.
- OPERATIONAL PGNS--A PGNS WITHOUT AN LGC, ISS, DSKY OR CES FAILURE(S)
- OPERATIONAL AGS--AN AGS WITHOUT AN AEA, ASA, BEDA OR CES FAILURE(S) PREVENTING AGS 3-AXIS ATTITUDE CONTROL.
- 3-AXIS TRANSLATION--ONE TTCA AND AN OPERATIONAL PGNS OR MANUAL (AGS MODE) TRANSLATION CAPABILITY.

DPS PROPULSION

- OPERATIONAL DPS PRIOR TO PDI IGNITION
  - FUEL AND/OR OXID ENGINE INLET PRESSURE GREATER THAN 30 PSIA.
  - FUEL AND OXID BULK TEMPERATURES GREATER THAN 50° F AND LESS THAN 90° F.
  - Δ TEMP BETWEEN FUEL AND OXID LESS THAN 10° F.
  - Δ PRESSURE (FUEL HIGH) LESS THAN 50 PSID.
  - PROPELLANT AND SUPERCRITICAL HELIUM ADEQUATE TO COMPLETE MISSION.
- AFTER PDI IGNITION
  - FUEL AND/OR OXID ENGINE INLET PRESSURES GREATER THAN 150 PSIA (ULLAGE PRESSURES GREATER THAN 160 PSIA).
  - THROAT AREA INCREASE LESS THAN 62 PERCENT.
  - ADEQUATE PROPELLANT AND SUPERCRITICAL HELIUM TO COMPLETE MISSION.
- DPS INSERTION CAPABILITY--THE ABILITY TO OBTAIN A SAFE INSERTION USING ONLY THE DPS.

APS PROPULSION

- OPERATIONAL APS
  - PREPRESSURIZATION
    - Δ PRESSURE BETWEEN APS FUEL AND OXID ENGINE INLET PRESSURES LESS THAN 90 PSID.
    - Δ TEMP BETWEEN APS FUEL AND OXID LESS THAN 10° F.
    - APS FUEL AND/OR OXID TEMP GREATER THAN 50° F AND LESS THAN 90° F.
    - APS FUEL OR OXID INLET PRESSURE GREATER THAN 62 PSIA AND LESS THAN 220 PSIA.
    - REDUNDANT PRESSURIZATION PATHS AND NO HELIUM TANK/LINE LEAKS.
  - POST-PRESSURIZATION
    - Δ PRESSURE BETWEEN FUEL AND OXID INLET PRESSURES LESS THAN OR EQUAL TO 15 PSID.
    - FUEL AND/OR OXID INLET PRESSURES GREATER THAN 105 PSIA. (ULLAGE PRESSURE GREATER THAN 110 PSIA).
    - ADEQUATE PROPELLANT AND SOURCE PRESSURE TO COMPLETE MISSION.

REACTION CONTROL

- OPERATIONAL RCS
  - AN RCS CONTAINING 8 OPERATIONAL THRUSTERS SUPPLIED BY ITS OWN PRESSURIZATION AND PROPELLANT FEED SYSTEM INDEPENDENT OF ASCENT FEED AND CROSSFEED.
  - FUEL AND/OR OXID MANIFOLD PRESSURES GREATER THAN OR EQUAL TO 100 PSIA.
  - FUEL TEMP GREATER THAN OR EQUAL TO 40° F AND LESS THAN OR EQUAL TO 100° F.
  - QUAD TEMPS GREATER THAN 119° F.

REV

GO/NO-GO CRITERIA

GO/NO-GO ITEM	UNDOCK TO PDI	POWERED DESCENT		LUNAR STAY W/EVA	LM ACTIVE RNDZ
		PDI TO 6+10	6+10 TO HI GATE		
1. GUIDANCE STEERING		1			
2. 3-AXIS ATT CONT		BOTH	3		
3. 3-AXIS TRANS					2
4. FDAT-ATT/RATES/ERR					
5. T/D 40 SEC OF 57 PERCENT GTC					
6. VHF RING/CSH OPTICS					
7. RR					
8. AOT					
9. LR					
10. DPS AUTO ON					
11. REDNT APS ON					
12. PGR GDA TRIM					
13. HAN THTL (1 TTCA)					
14. AUTO THTL					
DPS					
1. OPERATIONAL DPS					
2. ADEQUATE PROP					
3. FTP BLOWDOWN CAPABILITY					
APS					
1. OPERATIONAL APS					
2. NO PROP LEAKS					
3. NO HE LEAKS/REDUNDANT PRESS PATH					
RCS					
1. OPERATIONAL RCS					
2. RCS LEAKS					
3. NO IMPINGEMENT LIMITS EXCEEDED					

GENERAL NOTES

- LOSS OF AGS GUIDANCE STEERING IS ACCEPTABLE PROVIDED RNDZ 3-AXIS ATT CONT EXISTS
- LOSS OF PGNS OR AGS GUIDANCE STEERING IS ACCEPTABLE PROVIDED RNDZ 3-AXIS CONT EXISTS
- FOR SINGLE CONTROL MODE, LANDING IS CREW OPTION
- AGS RATE CMD MAY CONSIST OF 2 AXIS RATE CMD AND ONE DIRECT, I.E. ONE RATE GYRO FAILED
- NO AUTO ULLAGE PLUS NO AUTO START--PDI NO GO
- MANUAL IS MANDATORY PLUS EITHER PGNS AUTO OR AGS AUTO
- GDA WILL BE COMMANDED OFF--ABORT STAGE IF IMPINGEMENT LIMITS VIOLATED
- WORK-AROUND PROCEDURE EXISTS FOR MAXIMUM THRUST
- INHIBIT DPS BURSTS
- ASCEND NEXT BEST OPPORTUNITY
- ABORT STAGE PRIOR TO INLET PRESSURES REACHING 150 PSIA

LEGEND

- ABORT, THEN ABORT STAGE AT DPS DEPLETION IF:
  - LOW LEVEL CONFIRMS INSUFFICIENT PROPELLANT TO LAND
  - Δ BETWEEN FUEL AND OXIDIZER QUANTITY IS GREATER THAN 10 PERCENT
  - PGNS READING 2 PERCENT AND NO VALID TIME ESTIMATE FROM LOW LEVEL
  - DPS PROPELLANT MARGIN PREDICTED LESS THAN MINUS 0.2 PERCENT AFTER ENTRY INTO P6A (CONFIRMED BY OTHER CUES)
- APS HELIUM SOURCE LEAK AFTER PRESSURIZATION REQUIRES IMMEDIATE LIFTOFF
- IF MANIFOLD PRESSURE LESS THAN 100 PSIA, AND LEAK UPSTREAM OF MAIN SOV, CROSSFEED FROM GOOD SYSTEM
- CONTINUE MISSION ONLY IF RCS BLOWDOWN CAPABILITY EXISTS TO MEET CONSUMABLE REDLINES
- ABORT STAGE AS SOON AS POSSIBLE
- CONTINUE MISSION AFTER CIRC
- LOSS OF SOME TRANSLATIONAL CAPABILITY REQUIRES HYBRID LM/CSM MANEUVERS DURING DOCKING PHASE

NO REQUIREMENT

NO REQUIREMENT

APS NOT REQ FOR RNDZ

APS NOT REQ FOR RNDZ

NO LKS

NO LKS

A OR B

A OR B

A & B

A & B

IMMED L/O

IMMED L/O

NO IMPINGEMENT LIMITS EXCEEDED

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EVA MISSION RULES

GO/NO-GO CRITERIA/SPECIFIC RULES

LUNAR SURFACE EVA

REV

LUNAR SURFACE EVA

REV

OPERATIONAL PGA

- 9. MUST PASS EMU INTEGRITY CHECK AND HAVE ALL CONNECTORS LOCKED AND ALL RESTRAINTS CABLES EXCEPT GLOVE OR NECK CABLES INTACT. NOTE ONLY A SINGLE LOCKING MECHANISM IS REQUIRED FOR EACH CONNECTOR.
- 10. TERMINATE EVA--THE CREW WILL BE ALLOWED SUFFICIENT TIME TO CLOSE OUT THE ACTIVITY IN WHICH THEY ARE ENGAGED (5 TO 10 MINUTES) AND WILL THEN RETURN TO THE LM AND EXPEDITIOUSLY COMPLETE CLOSEOUT ACTIVITIES AS REQUIRED.
- 11. TERMINATE EVA IMMEDIATELY--THE CREW WILL CEASE THEIR SURFACE ACTIVITIES AND IMMEDIATELY RETURN TO THE LM, INGRESS, AND REPRESSURIZE.
- 12. CRITICAL INSTRUMENTATION

MEAS DESCRIPTION	PAM F11/FM	ONBOARD
PGA PRESS GAGE	GT8168P/GT8268P	CUFF GAGE } 1 OF 3 TONE } M
LOW PGA PRESS TONE		TONE } 1 OF 2 TONE } M
LOW VENT FLOW TONE	GT8140C/GT8240C	
PLSS BAT CURRENT		

CMP EVA

- 1. CMP EMU PRESSURE INTEGRITY
  - A. ABLE TO MEET MAX 0.8 PSID/MIN DECAY CRITERIA DURING EMU PRESSURE INTEGRITY CHECK.
  - B. CMP EMU REGULATED PRESSURE NOT LESS THAN 3.70 PSID (CREWMAN) AND DECREASING OR GREATER THAN 4.0 PSID (CREWMAN) AND INCREASING DURING CMP EVA.
- 2. ADEQUATE O<sub>2</sub> FLOW FROM SCU
  - CMP EMU O<sub>2</sub> FLOW INTO SUIT GREATER THAN 6.0 LBS/HR (60 TO 65 PSI UMBILICAL PRESS)
- 3. TERMINATE CMP EVA--THE CREWMAN WILL CEASE PLANNED EVA ACTIVITIES, TRANSFER TO THE CM, INGRESS AND REPRESSURIZE.
- 4. CRITICAL INSTRUMENTATION
  - PGA PRESS GAGE } 1 OF 2  
LOW PRESS WARNING SWITCH } M
  - LOW FLOW WARNING SWITCH } 1 OF 2  
CM PRESS GAGE } M

LUNAR SURFACE EVA

EMU PRESSURE INTEGRITY

- A. ABLE TO PASS EMU PRESSURE INTEGRITY CHECK (HIGH O<sub>2</sub> FLOW FLAG CLEARS AFTER INITIAL REPRESSURIZATION).
- B. PROPER PRESSURE REGULATION [LOST IF REGULATED PRESSURE LESS THAN 3.75 PSID (TM) AND DECREASING OR LUNAR SURFACE].

- OPERATIONAL PRIMARY OXYGEN SUBSYSTEM (POS)
  - A. SOURCE PRESSURE GREATER THAN 220 PSIA OR 5 PERCENT (INDICATOR).
  - B. ABLE TO SUPPLY OXYGEN TO OXYGEN VENTILATION LOOP.
  - C. PROPER PLSS PRESSURE REGULATION [NOT LESS THAN 3.75 PSID (TM) AND DECREASING OR GREATER THAN 4.05 PSID (TM) AND INCREASING].

OPERATIONAL PLSS POWER SUPPLY

- A. PLSS BATTERY VOLTAGE GREATER THAN OR EQUAL TO 16.0 VDC AND STABLE
- B. PLSS BATTERY CURRENT DRAITH GREATER THAN 2.0 AMPS

PLSS & BSLSS THERMAL CONTROL CAPABILITY

- LIQUID COOLED GARMENT/LIQUID TRANSPORT LOOP CIRCULATION.
- PLSS THERMAL CONTROL CAPABILITY
- A. LCG H<sub>2</sub>O INLET TEMPERATURE AND SUBLIMATOR O<sub>2</sub> OUTLET TEMPERATURE LESS THAN 50° F AND LCG H<sub>2</sub>O IT GREATER THAN 5° F WITH DIVERTER VALVE IN MAX POSITION.
- B. FEEDWATER RESERVOIR INTEGRITY AND THE ABILITY TO SUPPLY H<sub>2</sub>O TO SUBLIMATOR.

VENTILATION CAPABILITY--OPERATIONAL FAN (BAT CURRENT GREATER THAN 2.0 AMPS)

- CONTAMINATION CONTROL CAPABILITY
- A. VENTILATION CAPABILITY
- B. PLSS CO<sub>2</sub> PARTIAL PRESSURE LESS THAN 15.0 MM OF HG
- C. INSUFFICIENT CONTAMINATION (LIQH AND BY-PRODUCTS) IN THE VENTILATION LOOP TO RESULT IN CREWMAN DISCOMFORT

OPERATIONAL OXYGEN PURGE SYSTEM (OPS)

- A. 15 MINUTES HI PURGE CAPABILITY AT THE END OF A PLANNED EVA.
  - OPS RESIDUALS ARE:
    - 1. GREATER THAN 240 PSIA AT HIGH PURGE
    - 2. GREATER THAN 90 PSIA AT LOW PURGE
    - 3. GREATER THAN 100 PSIA AT MAKEUP
- B. OPS O<sub>2</sub> REGULATED PRESSURE GREATER THAN 3.4 AND LESS THAN 4.0 PSID, OR OPS O<sub>2</sub> REGULATED PRESSURE DOES NOT GO FROM 4.0 TO 5.0 PSID IN LESS THAN 1 SEC. THE OPS WILL BE CONSIDERED UNACCEPTABLE FOR MAKEUP MODE OPERATIONS IF THE OPS O<sub>2</sub> REGULATED PRESSURE EXCEEDS 4.0 PSID.
- C. PURGE VALVE (REDUNDANT LOCKING PIN NOT REQUIRED)

LUNAR SURFACE EVA

IF NO-GO

- 1. THE BSLSS WILL BE CARRIED ON ALL TWO-MAN EVA TRAVERSES. IF ITS USE IS REQUIRED, THE TETHER WILL BE ATTACHED FOR ALL OPERATIONS EXCEPT GETTING ON AND OFF THE LRV AND INGRESSING LM. FOR THESE ACTIONS, THE BSLSS WILL BE DISCONNECTED FROM THE CREWMAN WITH THE FAILED PLSS.
- 2. INTERMITTENT OPS PURGING FOR DECONTAMINATION OR ADDITIONAL COOLING REQUIRES THE PRIMARY O<sub>2</sub> SHUTOFF VALVE BE TURNED OFF FOLLOWING OPS ACTIVATION, BUT PRIOR TO PURGING. THE PURGE VALVE SHOULD BE CLOSED PRIOR TO REOPENING THE PRIMARY O<sub>2</sub> SHUTOFF VALVE AND DEACTIVATION OF THE OPS.
- 3. CREWMAN MAY ATTEMPT A WET SUBLIMATOR RESTART IF BREAKTHROUGH OCCURS.
- 4. VACUUM TRANSFERS WILL BE USED ONLY IN SUPPORT OF:
  - A. CONTINGENCY INTRAVEHICULAR TRANSFERS OR CONTINGENCY EXTRAVEHICULAR ACTIVITIES
  - B. A LM CABIN REPRESS FAILURE
- 5. AN EMU/LM ECS HYBRID LIFE SUPPORT AND COMM CONFIGURATION IS ACCEPTABLE IF WITHIN SYSTEMS CAPABILITIES AND IF REQUIRED TO PRECLUDE TIMELINE IMPACT.
- 6. BOTH PLSS'S AND OPS'S WILL BE RETAINED UNTIL TWO LIFE SUPPORT UNITS (2 OPS, 2 PLSS, OR 1 PLSS + 1 OPS) HAVE BEEN VERIFIED TO HAVE SUFFICIENT CONSUMABLES TO SUPPORT CONTINGENCY EXTRAVEHICULAR ACTIVITIES.
- 7. THE LM WILL NOT BE PRESSURIZED WITH A CREWMAN ON THE LUNAR SURFACE.
- 8. FOR THE 2 MAN EVA, THE CDR WILL ALWAYS EGRESS FIRST AND INGRESS LAST UNLESS THE CDR HAS INITIATED AN OPS PURGE. THIS WILL ENSURE THAT THE CDR IS IN THE LEFT PILOT POSITION SHOULD ASCENT BE REQUIRED WITHOUT AN OPPORTUNITY TO DOFF THE EMU'S.

GO/NO-GO ITEM	ITEM	TERMINATE EVA IMMEDIATELY	IF NO-GO	TERMINATE EVA	NOTES
PROPER VENTILATION	TION	X			①
PLSS POWER		X			②
CONTAMINATION CONTROL	CONTROL	X			①
EMU PRESS INTEGRITY	GRITY				③
A. PRESS <3.4 PSID	PSID	X		X	
B. 3.4 <PRESS <3	<3.5 PSID				
THERMAL CONTROL	IL			X	②
PRIMARY O <sub>2</sub> SUPPLY	PLY			X	③ ④
CRITICAL INSTRUMENTATION	UMENTATION			X	
OPERATIONAL OPS	S			X	
OPERATIONAL PGA	GA			X	

NOTES:

- ① ACTIVATE OPS: OPEN PGA PURGE VLV -- LOW FLOW.
- ② ACTIVATE BS: BSLSS AND/OR OPS PURGE AS REQUIRED.
- ③ ACTIVATE OP: OPS
- ④ IF EMU REG AFTER ACTUA: YES, PRESS GREATER THAN 4.05 PSID, CLOSE POS SHUTOFF VLV

CMP EVA

GO/NO-GO	GO ITEM	IF NO-GO	TERMINATE EVA AS REQUIRED	TERMINATE EVA
EMU PRESSURE INTEGRITY	TEGRITY		X	
ADEQUATE O <sub>2</sub> FLOW (FROM SCU)	LOW (FROM SCU)		X	
CRITICAL INSTRUMENTATION	UMENTATION			X

COMMUNICATIONS/INSTRUMENTATION GO CRITERIA  
9/1/72

FCO 5-69.25.5B

GO/NO-GO ITEM	EARTH ORBIT		TLC		LUNAR ORBIT (BEFORE UNDOCKING)		UNDOCKING		CIRC/DO <sub>2</sub>		POWERED DESCENT		LUNAR STAY			LUNAR POST-TREND		TEC	
	CONT BOOST	CONT E.O.	TLI	TD&E	CONT TLC	L01	CONT L01	CONT L.O./DO1	NOMINAL MISSION	CIRC/DO <sub>2</sub>	PDI TO PDI +6:10 GATE	PDI +6:10 TO HI GATE	HI GATE TO T/O	STAY W/O EVA	2-MAN EVA	1-MAN EVA	RENDEZVOUS LM ACTIVE	POST DOCK	TEC
USB 2-WAY VOICE COMM	1		CSM			CSM AND L.M.	CSM AND L.M.	CSM & LM	CSM AND L.M.				CSM (3)	CSM (3)	CSM (3)	CSM (3)			
VHF COMM LM/CSM						CSM													
VHF COMM LM (LCRU)/EVA																			
VHF COMM EVA/EVA																			
MSFN/EVA VOICE																			
CRITICAL INSTRUMENTATION																			
LM TELEMETRY																			
CSM TELEMETRY																			
CSM SCE																			

LEGEND: [ ] NO REQUIREMENT

- 1 VHF IS ACCEPTABLE
- 2 RESERVED
- 3 LM RELAY TO CSM IS ACCEPTABLE
- 4 ADEQUATE DATA TO MAKE FINAL GO/NO-GO TO CONTINUE POWERED DESCENT (TM OR ONBOARD DISPLAY)
- 5 CSM AND LM COMM IS REQUIRED FOR DOI
- 6 IF LM PROBLEM IS DEFINED, CONTINUE EVA PREP AND ACTIVATE LCRU ASAP
- 7 CSM AND LM CRITICAL INST REQUIRED FOR DOI
- 8 VOICE UPLINK TO EITHER CREWMAN, VOICE DOWNLINK FROM ONE CREWMAN OR TV
- 9 VOICE CONFIRMATION OF CIRC MNVR IS MANDATORY FOR DOI<sub>2</sub>

OSO MISSION RULES - OPTICS ICS

9/1/72

SPECIFIC MISSION RULES

PANORAMIC CAMERA		MC/LA DOOR	
CONDITION/MALFUNCTION	TLC	CONDITION/MALFUNCTION	TLC
1. SIM TEMP SL1211T < 45° F OR ≥ 105° F	TURN 64K BIT DATA SYSTEM ON AND APPLY POWER TO THE CAMERA	CLOSED	
2. FORWARD LENS TEMP (SL1040T) NONOPERATE < 45° F	LEAVE HEATERS ENABLED	OPEN	
OPERATE ≥ 75° F	DISABLE HEATERS. GO TO COLD SOAK		
3. CAPPING SHUTTER FAILS OPEN OR CLOSED	LEAVE HEATERS ENABLED		
4. TEST CYCLE FAILS	TERMINATE PHOTO PASS		
5. STEREO MODE FAILS	CONTINUE OPERATION		
6. TB REMAINS GREY AT TURN-ON	OPER CAMERA FOR 1 MIN		
7. TB - BP DURING OPERATE	OPER CAMERA IN MONO MODE		
8. FORWARD MOTION COMPENSATION FAILS	CYCLE OPER/STBY SWITCH TO STBY FOR 30 SEC THEN BACK TO OPERATE. REMAIN IN OPERATE FOR GROUND ANALYSIS		
9. LOSS OF DOWNLINK DATA	CYCLE OPER/STBY SWITCH TO STBY FOR 30 SEC THEN BACK TO OPERATE. IF TB RETURNS TO TB - BP, GO TO STBY AND WAIT FOR GROUND ANALYSIS		
	CONTINUE OPERATION		

MAPPING CAMERA		MC/LA DOOR	
CONDITION/MALFUNCTION	TLC	CONDITION/MALFUNCTION	TLC
1. SIM TEMP SL1211T < 40° F OR ≥ 105° F	TURN 64K BIT DATA SYSTEM ON AND APPLY POWER TO THE CAMERA		
2. FORWARD LENS TEMP (SL1040T) NONOPERATE < 40° F	REMAIN IN STBY		
OPERATE ≥ 90° F	TURN CAMERA OFF		
3. TB - BP	TERMINATE PHOTO PASS		
4. FORWARD MOTION COMPENSATION FAILS	CONFIGURE FOR STBY MODE AND WAIT FOR GROUND ANALYSIS		
5. DEPLOYMENT MECHANISM RETRACTED	CONTINUE OPERATION		
6. LOSS OF DOWNLINK DATA	CONTINUE OPERATION		

LASER ALTIMETER		MC/LA DOOR	
CONDITION/MALFUNCTION	TLC	CONDITION/MALFUNCTION	TLC
1. SIM TEMP SL1211T < 30° F OR ≥ 150° F	SCHEDULE SIM BAY HOT/COLD SOAK AS REQUIRED		
2. CAVITY TEMP SL1094T < -10° F	LEAVE LASER ALTIMETER POWERED		
> 131° F AND INTER-PATTERN RANGE READOUT OR > 145° F	POWER DOWN LASER		
3. LOSS OF AUTO MODE	LIMIT OPER TO NOMINAL CAMERA MODE SEQUENCES		
4. LOSS OF VALID RANGE DATA IN CAMERA MODE	LIMIT OPER TO NOMINAL AUTO MODE SEQUENCES		
5. PFN VOLTAGE > 2900V	POWER DOWN LASER		
6. LOSS OF DOWNLINK DATA	LIMIT OPER TO NOMINAL CAMERA MODE SEQUENCES		

GENERAL

- PRIOR TO SIM DOOR JETTISON THE SIM EXPERIMENTS AND SCIENTIFIC DATA SYSTEM (SDS) WILL BE POWERED AS REQUIRED TO SUPPORT THE FOLLOWING FUNCTIONS:
  - THERMAL MONITORING AND THERMAL MANAGEMENT OF THE SIM BAY.
  - PERIODIC ADVANCEMENT OF THE PANORAMIC AND MAPPING CAMERA FILM.
- RESCHEDULING OF EXPERIMENT OPERATION IF REQUIRED DUE TO EXCESSIVE CAMERA TEMPERATURES. THE OPERATOR SHALL BE ADVISED OF ANY SCHEDULE CHANGES AND SHALL BE ADVISED OF THE GUIDELINES OF THE EXPERIMENT PRIORITIES.
  - LUNAR ORBIT SIM BAY EXPERIMENTS ARE LISTED BELOW IN THEIR ORDER OF PRIORITY.
    - LUNAR ORBIT
    - SM ORBITAL PHOTOGRAPHIC TASKS
    - 1R SCANNING RADIOMETER (ISR)
    - FAR UV SPECTROMETER (FUS)
  - IF CORONA IS DETECTED IN AN EXPERIMENT AND IS DEGRADING ONLY THAT EXPERIMENT, THAT EXPERIMENT'S OPERATION WILL NOT BE TERMINATED FOR THE MISSION BUT MAY BE RESCHEDULED TO MAINTAIN THE SCIENTIFIC RETURN.
  - ALL EXPERIMENT COVERS WILL NORMALLY BE CLOSED FOR THE FOLLOWING CONDITIONS AFTER SIM DOOR JETTISON:
    - ACTIVATION OF SM RCS JETS A2, A4, B1, OR B4
    - SPS BURNS
    - WATER AND URINE DUMPS\*
    - FUEL CELL PURGES\*
    - VIOLATION OF THE SURVIVANCE CONSTRAINTS
    - CSM EVAPORATOR OR LM SUBLIMATOR OPERATION\*
  - SM RCS THRUSTERS A2, A4, B1, AND B4 WILL BE DISABLED DURING ALL EXPERIMENT OPERATIONS.
  - WATER AND URINE DUMPS WILL BE INHIBITED FROM 3 HOURS BEFORE UNTIL IMMEDIATELY AFTER PC AND MC OPERATIONS.
  - A FAILURE OF ANY EXPERIMENT COVER OR EXTENSION MECHANISM WILL NOT PRECLUDE AN EVA FOR FILM RETRIEVAL.
  - THERE ARE THREE ACCEPTABLE CUES ON ANTENNA POSITION. THESE CUES ARE: 1. TELEMETRY CUES FROM THE ANTENNA POSITION. 2. SIGNAL ON TELEMETRY. 3. ANY ANTENNA THAT CANNOT BE VERIFIED AS RETRACTED BY ONE OF THESE MEANS WILL BE ASSUMED TO BE EXTENDED BEYOND THE SPS BURN LIMIT.
  - SIM BAY HARBOR REBLINES WILL NOT BE VIOLATED IN THE PURSUIT OF SCIENCE DATA UNLESS THE DATA BEING COLLECTED IS JUDGED TO BE MORE IMPORTANT THAN ALL SUBSEQUENT DATA.
    - "NO-GO" FOR LOI WILL NOT PRECLUDE SIM BAY DOOR JETTISON.
    - AN ATTITUDE DEADEND OF 0.5 DEGREES WILL BE USED DURING THE FOLLOWING OPERATIONS:
      - ALL CAMERA OPERATIONS
      - MANDATORY LASER ALTIMETER OPERATION
      - HF AND VHF ACTIVE SOUNDING MODES
      - UVS INERTIAL ATTITUDE HOLD TARGETS

REV

OPTICS MANAGEMENT

- THE FILM IN THE PANORAMIC AND MAPPING CAMERAS (PC AND MC) WILL BE Cycled AND INTERCHANGED AS WILL BE ACTIVATED TO MONITOR THESE FUNCTIONS.
  - DURING ALL SPS POWERED FLIGHT PHASES, THE PC WILL BE Cycled AND INTERCHANGED AS WILL BE ACTIVATED TO MONITOR THESE FUNCTIONS.
  - IN THE "STANDBY" MODE WITH IMAGE "ON" OFF, THE PC WILL BE Cycled AND INTERCHANGED AS WILL BE ACTIVATED TO MONITOR THESE FUNCTIONS.
- THE PC LENS STOW POSITION WILL BE VERIFIED PRIOR TO SIM DOOR JETTISON AND PRIOR TO THE FIRST CAMERA OPERATION TO ALLOW FOR THERMAL STABILIZATION. THE PC HEATERS WILL REMAIN ENABLED BETWEEN PHOTO PASSES.
- THE MC WILL BE PLACED IN "STANDBY" PRIOR TO THE FIRST CAMERA OPERATION TO ALLOW FOR THERMAL STABILIZATION. THE MC WILL REMAIN IN STBY BETWEEN PHOTO PASSES.
- IN THE EVENT OF EXCESSIVE GND USAGE, THE OPERATION OF ONE CAMERA WILL NOT BE TERMINATED TO SAVE ONE FOR THE OTHER CAMERA.
- TOTAL FAILURE OF THE GND SYSTEM WILL NOT PRECLUDE ATTEMPTS TO OPERATE THE MC AND PC.
- THE IMAGE MOTION RATE ON THE MC WILL BE ADJUSTED TO MINIMUM ERROR FOR THE ORBIT OF OPERATION.
- THE PC PHOTO SEQUENCES LISTED BELOW AND ALL PC PHOTOGRAPHY WITHIN 10° OF THE SUBSOLAR POINT WILL BE TERMINATED FOR A PC FWD LENS TEMP GREATER THAN 112° F. ALL OTHER PC PHOTO SEQUENCES WILL BE TERMINATED FOR A PC FWD LENS TEMP GREATER THAN 105° F.

REV

CONDITION/MALFUNCTION	TLC
1. FAILS	
1. EXCESSIVE GND USAGE	
2. GND DEPLETED	

NOTES

- AFTER FILM ADVANCE MESSAGE EITHER 1201T, 1204T, OR 120 AT 5° F
- THIS RULE ONLY APPLICABLE PRE SIM DOOR JETT
- SEE OPTICS MGMT RULE 11
- INSUFFICIENT DATA TO DISTINGUISH BETWEEN A FAILED CAPP A FAILED TM POINT
- A NO-GO INDICATION WILL BE RECEIVED IF ANY OF THE FOLLOWING CONDITIONS ARE SENSED:
  - STEREO MALFUNCTION
  - CAPPING SHUTTER NOT ACTIVATED
  - LENS ROTATION SIGNAL LOST
  - OUT OF FILM SIGNAL
- A NO-GO INDICATION WILL BE RECEIVED IF ANY ONE OF THE PARAMETERS IS IN THE IMPROPER STATE.
  - MC FRONT LENS TEMP
  - SCANNING RADIOMETER ELEMENT TEMP
  - SUPPLY CASSETTE TEMP
- REFERENCE MALFUNCTION PROCEDURE X.X.
- THIS RULE ALSO APPLICABLE TO THE TEC PHASE
- CONSIDERATION WILL BE GIVEN TO OPENING THE DOOR DURING DURING THE TEC EVA
- REFERENCE MALFUNCTION PROCEDURE X.X.
- CUE:
  - FOR MECHANICAL FAILURE, SL1031X READS "ON" CONTINUOUSLY IN STBY GND MODE. GND SHOULD BE DEPLETED IN 6 TO 8 HOURS. FOR ELECTRICAL FAILURE, SL1031X READS "ON" CONTINUOUSLY DURING PC OPERATION.
- CUE:
  - SL1031X READS "OFF" CONTINUOUSLY DURING PC OPERATION. JMW IF GND IS NOT SUPPLIED TO AIR BARS
  - BA WILL BE ENABLED FOR TRANSLATION MANEUVERS. FOR RESE DURING LM DESCENT AND LM ASCENT AND FROM 8 HOURS BEFORE ENTRY. INTERFACE TO PROVIDE COUPLED ATTITUDE CONTROL W PFLING RCS THRUSTERS ARE REQUIRED.
- PRIOR TO SIM DOOR JETT, THE UPPER NONOPERATING LIMIT IS LIMIT IS 100° F.

REV

OPTICS MANAGEMENT

- LA OPERATION WILL NOT BE ATTEMPTED WITH THE MC/LA DOOR CLOSED.
- IF EXCESSIVE TRAVEL TIMES ARE DETECTED DURING MC/LA POSITIONING, SUBSEQUENT CYCLES FOR CONTAMINATION PROTECTION WILL BE DELETED.
- IF THE LASER ALTIMETER LIFETIME IS JUDGED TO BE SHORTER THAN THE REMAINING MISSION ACQUISITION TIME, THE LA OPERATING PROFILE WILL BE REDUCED TO INSURE COVERAGE OF PRIORITY OBJECTIVES.

OSO MISSION RULES - SPECTROMETER

9/1/77

REV

NOTES

- 1 THIS RULE ONLY APPLIES TO PRE SIM DOOR JETTISON PHASE
- 2 THE SPECTROMETER WILL BE POWERED DOWN IF THE TEMPS GET ABOVE 125° F AND VALID DATA IS NOT BEING COLLECTED.
- 3 THE RADIOMETER WILL BE POWERED DOWN IF THE TEMPS GET ABOVE 100° F AND VALID DATA IS NOT BEING COLLECTED.
- 4 IF TEMP CONTINUES TO INCREASE, COLD SOAK WILL BE REQUIRED.
- 5 OPERATING MODE WILL BE LIMITED TO RECEIVE-ONLY MODE.

FAR ULTRAVIOLET SPECTROMETER		LUNAR ORBIT/TEC
CONDITION/MALFUNCTION	TLC	
1. SIM TEMP SL12XX	<180° F >180° F	APPLY POWER TO SPECTROMETER GO TO COLD SOAK ATTITUDE
2. SPECTROMETER TEMPS SL1103T OR SL1102T	<- 35° F >180° F	LEAVE SPECTROMETER POWERED POWER DOWN SPECTROMETER (2)
3. CORONA IN THE UVS		TURN OFF SPECTROMETER ENHANCE OPERATING ENVIRONMENT
4. SUN APPROACHING FIELD-OF-VIEW		CLOSE SPECTROMETER COVER OPERATE TO OBTAIN ENGINEERING DATA
5. COVER FAILS	CLOSED OPEN	MINIMIZE DUMPS, PURGES, AND JET FIRINGS

INFRARED SCANNING RADIOMETER		LUNAR ORBIT/TEC
CONDITION/MALFUNCTION	TLC	
1. SIM TEMP SLXXXT	<180° F >180° F	APPLY POWER TO RADIOMETER GO TO COLD SOAK ATTITUDE
2. PRIMARY MIRROR TEMP SL1129T	<15° F >122° F	LEAVE RADIOMETER POWERED POWER DOWN RADIOMETER (3)
3. SUN APPROACHING FIELD-OF-VIEW		CLOSE RADIOMETER COVER
4. COVER FAILS	CLOSED OPEN	OPERATE TO OBTAIN ENGINEERING DATA MINIMIZE DUMPS, PURGES, AND JET FIRINGS

LUNAR SOUNDER		LUNAR ORBIT/TEC
CONDITION/MALFUNCTION	TLC	
1. SIM TEMP SL1206	<180° F >180° F	APPLY STBY PWR TO CSAR AND OPTICAL RECORDER GO TO COLD SOAK ATTITUDE
2. FILM CASSETTE TEMP SL1275T	<180° F >180° F	ENABLE OPTICAL RECORDER HITS REMOVE PWR FROM OPTICAL RECORDER HITS (4)
3. CSAR INTERNAL TEMP SL1256T	<180° F >180° F	GO TO COLD SOAK ATTITUDE APPLY STBY PWR TO CSAR
4. FILM MOTION FAILURE		REMOVE PWR FROM CSAR TERMINATE ACTIVE SOUNDER OPERATIONS (5)
5. LOSS OF PRF-1 AND PRF-2		TERMINATE SOUNDER OPERATION IN THE HF MODE
6. LOSS OF PRF-3		TERMINATE SOUNDER OPERATION IN THE VHF MODE
7. CLOCK FAILURE		TERMINATE ACTIVE SOUNDER OPERATION (5)
8. LOSS OF OSC FREQ LOCK		TERMINATE ACTIVE SOUNDER OPERATION (5)
9. LOSS OF VIDEO		TERMINATE ACTIVE SOUNDER OPERATION (5)
10. HF RF PWR OUTPUT <TBD		TERMINATE SOUNDER OPERATION IN HF MODE
11. VHF RF PWR OUTPUT <TBD	HGA HBR TM	TERMINATE SOUNDER OPERATION IN VHF MODE
12. EMI INTO LS ISOLATED TO		RESCHEDULE VHF OPERATIONS PERFORM FLIGHT PLAN ON LBR

HF ANTENNAS		LUNAR ORBIT/TEC
CONDITION/MALFUNCTION	TLC	
1. FAILURE TO FULLY EXTEND		OPERATE IN DEGRADED MODE
2. FAILURE TO RETRACT SAFE DISTANCE		JETTISON PRIOR TO NEXT SPS BURN

GENERAL

REV

- PRIOR TO SIM DOOR JETTISON THE SIM EXPERIMENTS AND SCIENTIFIC DATA SYSTEMS WILL BE POWERED AS REQUIRED TO SUPPORT THE FOLLOWING FUNCTIONS:
- A. THERMAL MONITORING AND THERMAL MANAGEMENT OF THE SIM BAY.
  - B. PERIODIC ADVANCEMENT OF THE PANORAMIC AND MAPPING CAMERA FILM.
  - C. RESCHEDULING OF EXPERIMENT OPERATION IF REQUIRED DUE TO EXCESSIVE CONSUMABLES USAGE (OCS, PWR, ETC.) OR UNDESIRABLE EXPERIMENTATION OPERATION WILL BE ACCOMPLISHED WITHIN THE OUTBELLS OF THE EXPERIMENT FRAMEWORKS.
  - D. LUNAR ORBIT SIM BAY EXPERIMENTS ARE LISTED BELOW IN THEIR ORDER OF PRIORITY.
    - A. LUNAR SOUNDER
    - B. SIM ORBITAL PHOTOGRAPHIC TASKS
    - C. IR SCANNING RADIOMETER (ISR)
    - D. FAR UV SPECTROMETER (FUS)
  - E. IF CORONA IS DETECTED IN AN EXPERIMENT AND IS DEGRADING ONLY THAT EXPERIMENT, THE EXPERIMENT'S OPERATION WILL BE CONTINUED UNTIL THE SCIENTIFIC RETURN.
  - F. ALL EXPERIMENT COVERS WILL NORMALLY BE CLOSED FOR THE FOLLOWING CONDITIONS AFTER SIM DOOR JETTISON:
    - A. ACTIVATION OF SIM BAY JETS A2, A4, B1, OR B4
    - B. SPS BURNS
    - C. WATER AND URINE DUMPS\*
    - D. FUEL CELL PURGES\*
    - E. VIOLATION OF THE SUN-AVOIDANCE CONSTRAINTS
    - F. CSM EVAPORATOR OR LM SUBLIMATOR OPERATION\*
  - G. \*N/A TO UVS COVER AFTER 2 DAYS IN CIRCULAR LUNAR ORBIT.
  - H. SIM RES THIRSTERS A2, A4, B1, AND B4 WILL BE DISABLED DURING ALL EXPERIMENT OPERATIONS.
  - I. WATER AND URINE DUMPS WILL BE INHIBITED FROM 3 HOURS BEFORE UNTIL IMMEDIATELY AFTER PC AND MC OPERATIONS.
  - J. A FAILURE OF ANY EXPERIMENT COVER OR EXTENSION MECHANISM WILL NOT PRECLUDE AN EVA FOR FILM RETRIEVAL.
  - K. THERE ARE THREE ACCEPTABLE CUES ON ANTENNA POSITION. THESE ARE THE APPROPRIATELY TALKING TO THE ANTENNA SAFE SIGNAL ON TELEMETRY. ANY ANTENNA THAT CANNOT BE VERIFIED AS RETRACTED BY ONE OF THESE MEANS WILL BE ASSUMED TO BE EXTENDED BEYOND THE SPS BURN LIMIT.
  - L. SIM BAY PANORAMIC RESOLINES WILL NOT BE VIOLATED IN THE PRESENT OF OPERATIONAL UVS. UVS DATA WILL BE COLLECTED IS JUDGED TO BE MORE IMPORTANT THAN ALL SUBSEQUENT DATA.
  - M. A "NO-GO" FOR LOI WILL NOT PRECLUDE SIM BAY DOOR JETTISON.
  - N. AN ATTITUDE DEADBAND OF 0.5° WILL BE USED DURING THE FOLLOWING OPERATIONS:
    - A. ALL CAMERA OPERATIONS
    - B. MANDATORY LASER ALTIMETER OPERATION
    - C. HF AND VHF ACTIVE SOUNDING MODES
    - D. UVS INERTIAL ATTITUDE HOLD TARGETS

REV

- FAR UV SPECTROMETER MANAGEMENT
1. UNTIL THE COMPLETION OF TWO DAYS IN CIRCULAR ORBIT, THE EXPERIMENT COVER WILL BE CLOSED FOR DUMPS AND PURGES. DUMPS AND PURGES WILL NOT BE SCHEDULED WITHIN 15 MINUTES OF THE START OF A DATA TAKE.
  2. THE EXPERIMENT COVER WILL BE CLOSED FOR THE ACTIVATION OF BLS JETS A2, A4, B1 AND B4 OR WHENEVER THE SUN ENTERS THE SPECTROMETER FOV.
- INFRARED SCANNING RADIOMETER
1. THE EXPERIMENT COVER WILL REMAIN CLOSED FOR 10 MINUTES FOLLOWING A DUMP OR PURGE.
  2. THE ISR SCAN DRIVE MOTOR WILL BE POWERED FOR SIM DOOR JETT.
- LUNAR SOUNDER
1. A MINIMUM OF 2 MINUTES OF HBR/HF MODE DATA WILL BE COLLECTED BEFORE AND AFTER THE 2 RECV ACTIVE MODE.
  2. SIM BAY JET CONFIGURATION WILL BE INITIATED A MINIMUM OF 30 MINUTES PRIOR TO OPTICAL RECORDER OPERATION.
  3. THE SOUNDER ROR AND OPTICAL ROR WILL BE THERMALLY PRECONDITIONED PRIOR TO DATA COLLECTION.
  4. ALL OTHER SIM BAY EXPERIMENTS AND THE SDS WILL BE POWERED DOWN DURING SOUNDER OPERATIONS.
  5. THE HGA WILL BE POWERED DOWN DURING THE HF AND RECEIVE ONLY MODES.
  6. THE LS TRANSMITTERS WILL NOT BE OPERATED WITHIN 100 FEET OF AN UNSTABED L/M.
  7. FAILURE OF THE HF ANTENNAS TO FULLY EXTEND WILL NOT PRECLUDE SOUNDER OPERATION IN THE HF AND LISTEN MODES.
  8. THE OPTICAL RECORDER FILM WILL NOT BE TRANSPORTED WITH LESS THAN 10 FEET OF FILM REMAINING.
  9. A CSM CONFIGURATION WILL BE ESTABLISHED FOR THE EMI TEST AND LS OPERATION. NO CONFIGURATION CHANGES WILL BE MADE TO RESOLVE EMI EXCEPT FOR POSSIBLE DOWNGRADING OF THE TELECOMMUNICATIONS SYSTEMS.

# NASA - Manned Spacecraft Center

## MISSION RULES

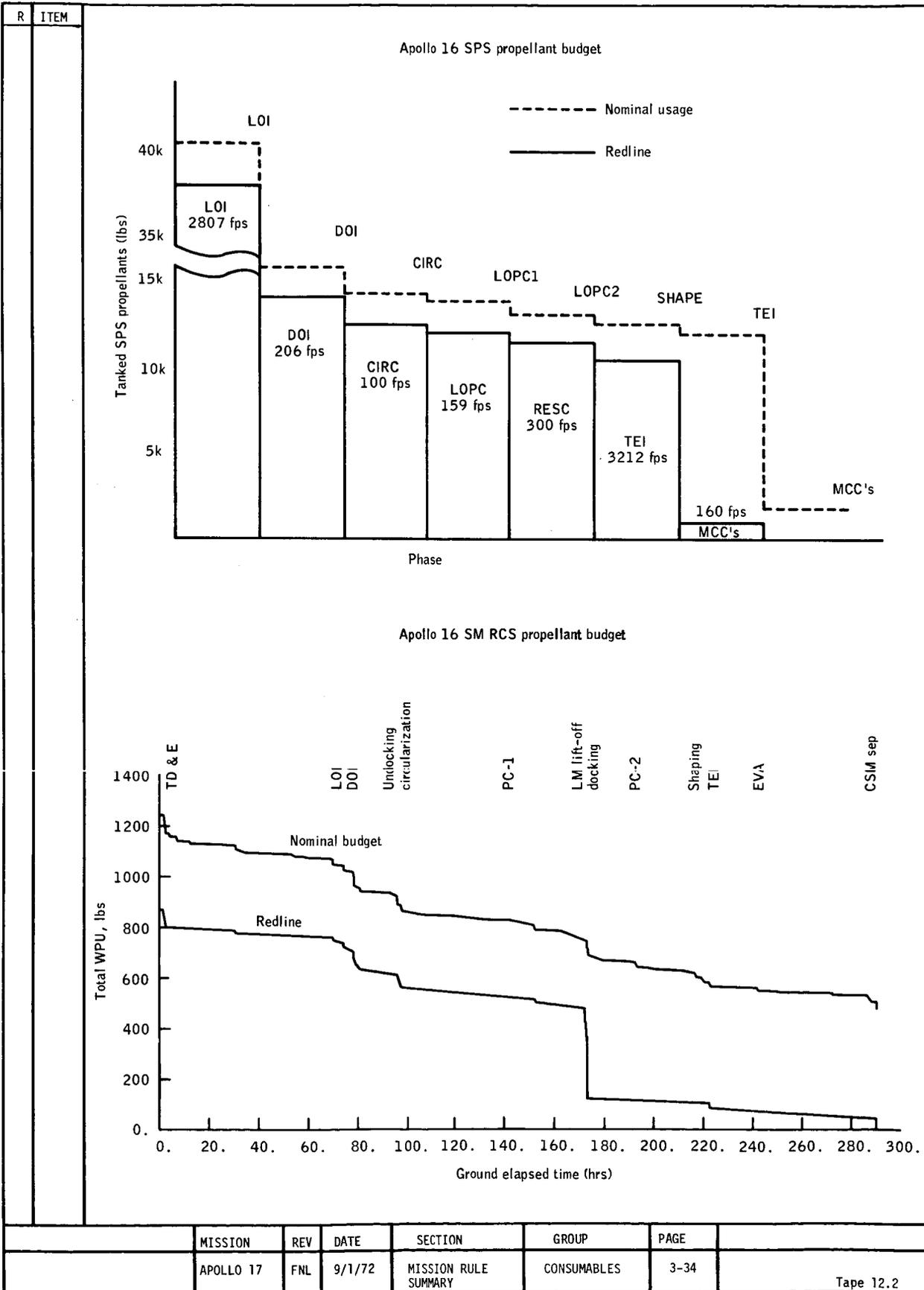
### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM																																								
		<u>CONSUMABLES</u>																																							
	3-90	<p><u>SPS</u> (APOLLO 16 DATA)</p> <p>A. THE SPS REDLINE WILL GUARANTEE SUFFICIENT PROPELLANT TO ACHIEVE A NOMINAL LUNAR ORBIT, LANDING, LM RESCUE AND A SAFE RETURN TO EARTH. VIOLATION OF THE SPS REDLINE WILL REQUIRE MNVR TRADE-OFFS AS SHOWN IN FMR 5-34. THE SPS REDLINE INCLUDES:</p> <table style="margin-left: 40px;"> <tr><td>LOI</td><td>24184 LBS</td><td>2807 FPS</td></tr> <tr><td>DOI</td><td>1522 LBS</td><td>206 FPS</td></tr> <tr><td>CIRC</td><td>370 LBS</td><td>100 FPS</td></tr> <tr><td>LOPC 1</td><td>576 LBS</td><td>159 FPS</td></tr> <tr><td>RESCUE</td><td>1108 LBS</td><td>300 FPS</td></tr> <tr><td>TEI</td><td>9542 LBS</td><td>3212 FPS (NOMINAL RETURN, 67 HRS)</td></tr> <tr><td>TEC MCC</td><td>415 LBS</td><td>160 FPS (3 SIGMA SCS C/O ON TEI)</td></tr> <tr><td>UNUSABLE</td><td>400 LBS</td><td>0 FPS</td></tr> </table> <p>B. THE MINIMUM SPS REQUIREMENTS FOR A LUNAR ORBIT MISSION ARE BASED ON A MINIMUM SOLO MISSION. THE SEQUENCE OF MANEUVERS WOULD BE LOI 1 (60 X 170), LOI 2 (60 X 60), TEI AND TEMC'S. THE FOLLOWING NUMBERS REPRESENT MINIMUMS WITHOUT RESPECT TO TRAJECTORIES OR OTHER VARIABLES AND SHOULD BE USED AS BASELINE DATA ONLY.</p> <table style="margin-left: 40px;"> <tr><td>LOI 1</td><td>11267 LBS</td><td>2775 FPS</td></tr> <tr><td>LOI 2</td><td>539 LBS</td><td>150 FPS</td></tr> <tr><td>TEI</td><td>8108 LBS</td><td>2650 FPS</td></tr> <tr><td>TEMC'S</td><td>1318 LBS</td><td>500 FPS</td></tr> <tr><td>UNUSABLE</td><td>400 LBS</td><td>0 FPS</td></tr> </table>	LOI	24184 LBS	2807 FPS	DOI	1522 LBS	206 FPS	CIRC	370 LBS	100 FPS	LOPC 1	576 LBS	159 FPS	RESCUE	1108 LBS	300 FPS	TEI	9542 LBS	3212 FPS (NOMINAL RETURN, 67 HRS)	TEC MCC	415 LBS	160 FPS (3 SIGMA SCS C/O ON TEI)	UNUSABLE	400 LBS	0 FPS	LOI 1	11267 LBS	2775 FPS	LOI 2	539 LBS	150 FPS	TEI	8108 LBS	2650 FPS	TEMC'S	1318 LBS	500 FPS	UNUSABLE	400 LBS	0 FPS
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	3-91	<p><u>SM RCS</u> (APOLLO 16 DATA)</p> <p>A. THE SM RCS REDLINE INCLUDES:</p> <ol style="list-style-type: none"> <li>1. NOMINAL USAGE FROM LAUNCH THRU TD&amp;E (75 LBS)</li> <li>2. POST TD&amp;E TO MCC-2. INCLUDES ALLOWANCE FOR ONE PTC, MANEUVER, TRIM &amp; DAMPING FOR MCC-2. (26 LBS)</li> <li>3. MCC-2 TO MCC-4. INCLUDES ALLOWANCE FOR TWO PTC'S, MANEUVER, TRIM AND DAMPING FOR MCC-4. (25 LBS)</li> <li>4. MCC-4 THRU LM UNDOCKING NOMINAL USAGE (174 LBS)</li> <li>5. CSM SOLO ATTITUDE HOLD FROM POST UNDOCKING THRU LM LIFT-OFF. INCLUDES ULLAGES AND TRIMS FOR CIRC AND PC-1. NO ALLOWANCE FOR SOLO EXPERIMENTS OR PHOTOGRAPHY THAT REQUIRES ADDITIONAL PROPELLANT (117 LBS)</li> <li>6. NOMINAL BUDGETED USAGE FROM LM LIFT-OFF TO DOCKING. ALSO INCLUDED ARE FOUR TO SECOND 4 JET ULLAGES, 1 FPS TRIMS AND CSM ACTIVE BRAKING, LM JETTISON AND SEPARATION (349 LBS)</li> <li>7. TWO REVS ATTITUDE HOLD PLUS TEI. INCLUDES ALLOWANCE FOR ONE P52, ULLAGE AND DAMPING (30 LBS)</li> <li>8. SEVEN FPS MCC (1 SIGMA G&amp;N TEI CUTOFF) (22 LBS)</li> <li>9. PTC ALLOWANCE (20 LBS)</li> <li>10. NOMINAL USAGE FROM MCC 7 TO CM/SM SEP (39 LBS)</li> </ol> <p>B. THE LUNAR ORBIT REDLINE REPRESENTS THE MINIMUM SMRCS PROPELLANT REQUIRED TO LEAVE LUNAR ORBIT AND PROVIDE A NOMINAL TRANSEARTH RETURN. VIOLATION OF THE LUNAR ORBIT REDLINE WILL RESULT IN TERMINATION OF LUNAR ORBIT ACTIVITIES. THE LO REDLINE INCLUDES:</p> <table style="margin-left: 40px;"> <tr><td>110 LBS</td><td>2 REVS LO, TEI ULLAGE AND DAMPING, NOMINAL TEC BUDGET.</td></tr> <tr><td>64 LBS</td><td>20 FPS MCC (3 SIGMA G&amp;N TEI CUTOFF)</td></tr> <tr><td colspan="2"><hr style="width: 20%; margin-left: 0;"/></td></tr> <tr><td>174 LBS</td><td>TOTAL</td></tr> </table> <p>RULE NUMBERS 3-92 THROUGH 3-100 ARE RESERVED.</p>	110 LBS	2 REVS LO, TEI ULLAGE AND DAMPING, NOMINAL TEC BUDGET.	64 LBS	20 FPS MCC (3 SIGMA G&N TEI CUTOFF)	<hr style="width: 20%; margin-left: 0;"/>		174 LBS	TOTAL																															
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		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>MISSION RULE SUMMARY</td> <td>CONSUMABLES</td> <td>3-33</td> <td style="text-align: right;">Tape 51.4</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	CONSUMABLES	3-33	Tape 51.4																									
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NASA - Manned Spacecraft Center

MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED



MISSION	REV	DATE	SECTION	GROUP	PAGE
APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	CONSUMABLES	3-34

Tape 12.2

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 3 - MISSION RULE SUMMARY - CONTINUED

R	ITEM								
	3-101	CSM BATTERY ENERGY AND CRYOGENIC O <sub>2</sub> AND H <sub>2</sub> (APOLLO 16 DATA)  THE FOLLOWING MINIMUM USABLE ENERGY/QUANTITIES MUST BE AVAILABLE TO INITIATE THE SPECIFIC PHASES.							
			LAUNCH	LOI	UNDOCK	LOPC		SHAPE MNVR	
						1	2		
		BAT AMP-HOURS REMAINING	3 BAT	90.8 <sup>①</sup>	80.8	72.7	68.4	64.6	58.2
			2 BAT	56.1	47.1	43.4	42.2	41.0	38.1
		O <sub>2</sub> TOTAL LBS	3 TANKS	782	631	584	477	398	352
		H <sub>2</sub> TOTAL LBS	3 TANKS	64.9	50.3	45.7	33.4	24.5	18.9
		<p>① ENERGY REQUIREMENT TO PERFORM NOMINAL MISSION WITHOUT CHARGER. REDLINE DOES NOT ALLOW PRE-LOI GIMBAL DRIVE CHECK OR BACKUP SPS BURN PREPS AND REQUIRES POWER DOWN OF ECS RADIATOR HEATERS OVERLOAD SENSING.</p> <p style="text-align: center;"><u>NOTES</u></p> <p>(A) PRELAUNCH BATTERY REDLINES ARE BASED ON FAILURE OF THE BATTERY CHARGER BEFORE ACCOMPLISHING ANY CHARGING.</p> <p>(B) THE TWO BATTERY REDLINES REFLECT THE ENERGY REQUIRED IN THE TWO LOWEST BATTERIES TO PROVIDE CAPABILITY FOR A SAFE RETURN FROM ANY POINT IN THE MISSION. THE REDLINES ARE BASED ON LOSS OF THE HIGHEST BATTERY SUBSEQUENT TO LOSS OF THE BATTERY CHARGER WITH A TWO-BATTERY ENTRY (WITH G&amp;N) AND 12 HOURS OF POSTLANDING TIME.</p> <p>(C) IF RESCUE IS REQUIRED, THE THREE-BATTERY ENERGY REQUIREMENTS WILL BE RECOVERED BY POWERING DOWN TO A TWO-BATTERY G&amp;N ENTRY.</p> <p>(D) AUX BAT ENERGY IS NOT INCLUDED IN BAT REDLINES.</p> <p>(E) CONSIDERATION WILL BE GIVEN TO PERFORMING SPS BURNS WITHOUT BATTERY SUPPLEMENT IF REDLINE NOT MET.</p> <p>(F) CRYOGENIC REDLINES ARE BASED ON CAPABILITY TO PERFORM NOMINAL MISSION WITH CAPABILITY TO RETURN TO EARTH AT A 40 AMP AVERAGE POWER LEVEL AFTER LOSS OF ANY CRYO TANK AT THE WORST CASE TIME FOR FAILURE.</p> <p>(G) THREE-TANK CRYOGENIC REDLINE IS BASED ON THE TOTAL QUANTITY REQUIRED TO PERFORM NOMINAL LENGTH MISSION.</p> <p>RULE NUMBERS 3-102 THROUGH 3-110 ARE RESERVED.</p>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE		
		APOLLO 17	FNL	9/1/72	MISSION RULE SUMMARY	CONSUMABLES	3-35	Tape 51.5	

LM CONSUMABLE REQUIREMENTS / MANAGEMENT  
TELMU  
9/1/72

1. EPS AND ECS MINIMUM CONSUMABLE REQUIREMENTS

A. FROM UNDOCKING TO TOUCHDOWN, THE MINIMUM REQUIREMENTS ARE BASED ON THE TIME TO COMPLETE A LANDING, A 24.5-HR STAY WITH ONE EVA, ASCENT, AND A 2.0-HR RENDEZVOUS THROUGH CREW TRANSFER, A 2-HR ORBITAL CONTINGENCY, AND REDUNDANT ASCENT EPS SOURCES FOR THE RENDEZVOUS.

THE TIME TO COMPLETE A LANDING AND THE 24.5-HR LUNAR STAY MAY BE SUPPORTED BY ANY COMBINATION OF DESCENT AND ASCENT CONSUMABLES. IN ADDITION, EACH ASCENT BATTERY, ONE H<sub>2</sub>O TANK AND ONE ASCENT O<sub>2</sub> TANK (THE LM CABIN IS CONSIDERED A REDUNDANT O<sub>2</sub> SOURCE) MUST CONTAIN THE CONSUMABLES REQUIRED FOR LIFTOFF AND A 2.0-HR RENDEZVOUS THROUGH CREW TRANSFER. THE 2-HR ORBITAL CONTINGENCY, INsofar AS ASCENT O<sub>2</sub> AND ELECTRICAL POWER ARE CONCERNED, IS CONSIDERED TO BE SATISFIED BY THE REDUNDANCY REQUIREMENT. SHOULD TWO ASCENT H<sub>2</sub>O TANKS BE AVAILABLE, THE REQUIREMENT FOR LIFTOFF THROUGH CREW TRANSFER CAPABILITY IN EACH TANK WILL SATISFY THE 2-HR ORBITAL CONTINGENCY. IF ONLY ONE TANK IS AVAILABLE, IT MUST ALSO INCLUDE THE 2-HR CONTINGENCY.

B. FOR THE REMAINDER OF THE LUNAR STAY, THE MINIMUM DESCENT STAGE REQUIREMENTS ARE BASED ON THOSE CONSUMABLES REQUIRED FOR THE SCHEDULED ACTIVITIES DURING EACH DEFINED PHASE, AN ASCENT PREPARATION, AND A 2-HR SURFACE RESERVE. THE LAST 4 HOURS OF THIS REQUIREMENT FOR EPS MUST BE SPLIT-BUS OPERATION. ASCENT STAGE MINIMUM REQUIREMENTS ARE AS STATED ABOVE.

C. FOR THE RENDEZVOUS, THE MINIMUM REQUIREMENTS ARE THOSE CONSUMABLES NECESSARY TO SUPPORT A LM-ACTIVE RENDEZVOUS THROUGH CREW TRANSFER. SHOULD THESE MINIMUM REQUIREMENTS BE VIOLATED, THE LM WILL BE POWERED DOWN WHILE THE CSM BECOMES THE ACTIVE VEHICLE. HOWEVER, THE LM WILL BE POWERED UP TO PERFORM BRAKING WITH SUFFICIENT CONSUMABLES BEING RETAINED FOR THIS PURPOSE.

D. TWO POUNDS OF OXYGEN CONTAINED IN THE LM CABIN AT 5.3 PSIA WILL BE CONSIDERED AVAILABLE IN CALCULATING MINIMUM O<sub>2</sub> REQUIREMENTS. THE CABIN CAN BE CONSIDERED, WHEN DISCUSSING FUNCTIONAL PRESSURE VESSEL REQUIREMENTS, AS A BACKUP TO THE ASCENT O<sub>2</sub> TANKS.

II. EMU CONSUMABLE REQUIREMENTS

A. GO/NO-GO'S

- NOMINAL AND ALTERNATE EVA'S  
AMP-HRS, O<sub>2</sub>, LION AND H<sub>2</sub>O QUANTITIES REQUIRED TO COMPLETE EVA PREP, EVA, PLUS THE VALUES REQUIRED FOR 30 MINUTES OF POST EVA RESERVE.
- CEVA  
BOTH PLS'S AND OPS WILL BE RETAINED UNTIL TWO LIFE SUPPORT UNITS (2 OPS, 2 PLS'S OR 1 PLS AND 1 OPS) HAVE BEEN VERIFIED TO HAVE SUFFICIENT CONSUMABLES TO SUPPORT CEVA (MINIMUM OF 15 MIN LIFETIME: OPS IN HI FLOW)

B. REDLINES  
NOMINAL AND ALTERNATE EVA'S-PLSS AMP-HOURS, O<sub>2</sub>, LION, AND H<sub>2</sub>O REQUIRED FOR 30 MINUTES OF POST EVA RESERVE.

C. EXCURSION CONSTRAINTS

EVA EXCURSION LIMITATIONS ARE A FUNCTION OF TRAVERSE MODES (RIDING OR WALKING), NUMBER OF EVA CREWMAN, EVA EQUIPMENTS AVAILABLE, AND PLS CONSUMABLES REMAINING.

- FOR A TWO-MAN RIDING TRAVERSE THE FOLLOWING WILL APPLY:
  - EVA EXCURSIONS WILL BE LIMITED TO ALLOW WALKBACK FROM A FAILED LRV ASSUMING NO PLS FAILURES.
  - EVA EXCURSIONS WILL BE LIMITED TO ALLOW RIDEBACK WITH A FAILED PLS, USING BSLS AND OPS IN LOW PURGE FLOW.
  - EVA EXCURSIONS WITHOUT THE BSLS (OR IF THE BSLS IS BEING USED) WILL BE LIMITED ALLOWING WALKBACK TO THE LRV (≤ 100 METERS) AND RIDING ON LRV USING OPS LOW PURGE FLOW AND ALLOWING 13 MIN AT HIGH PURGE FLOW FOR INGRESS. AN ARBITRARY 10 MIN PAD WILL BE IMPOSED FOR THE LOW PURGE FLOW PHASE.
- FOR A TWO-MAN WALKING TRAVERSE THE FOLLOWING WILL APPLY:
  - EVA EXCURSIONS WILL BE LIMITED TO A BSLS WALKBACK CAPABILITY USING THE OPS IN LOW PURGE FLOW.
  - WITH NO BSLS, THE EVA EXCURSIONS WILL BE LIMITED, ALLOWING LM RETURN USING THE OPS IN HIGH PURGE FLOW.
- FOR A ONE-MAN RIDING TRAVERSE THE FOLLOWING WILL APPLY:
  - EVA EXCURSIONS WILL BE LIMITED TO WALKBACK FROM A FAILED LRV ASSUMING NO PLS FAILURES.
  - EVA EXCURSIONS WILL BE LIMITED TO ALLOW WALKBACK TO LRV (≤ 100 METERS) AND RIDING ON THE LRV USING OPS LOW PURGE FLOW AND ALLOWING 13 MIN AT HI PURGE FLOW FOR INGRESS. AN ARBITRARY 10 MIN PAD WILL BE IMPOSED FOR THE LOW PURGE FLOW PHASE.
- FOR A ONE-MAN WALKING TRAVERSE THE FOLLOWING WILL APPLY:
  - EVA EXCURSIONS WILL BE LIMITED TO ALLOW WALKBACK TO THE LM, UTILIZING THE OPS IN HIGH PURGE FLOW.
- ALL EMERGENCY RETURNS ARE CONSTRAINED BY THE 300 BTU MAXIMUM CREWMAN HEAT STORAGE AND THE 13 MINUTES REQUIRED FOR TERMINATION AND INGRESS. ALL RIDING AND WALKING RATES ARE UNCORRECTED MAP RATES.

(A) RIDING TRAVERSES

- THE LRV/BSLS/OPS (L) RETURN TRAVERSE CAPABILITY REPRESENTS AN OPS LOW PURGE FLOW RATE OF 4.0 LBS/HR, TIME REQUIRED FOR WALKBACK TO THE LRV AT 4.0 KM/HR, 5 MINUTES FOR BSLS ACTIVATION, AND THE TIME REQUIRED FOR LRV RETURN TRAVERSE AT 7.3 KM/HR.
- THE LRV/OPS (L/H) RETURN TRAVERSE CAPABILITY REPRESENTS AN OPS LOW PURGE FLOW RATE OF 4.0 LBS/HR FOR WALKBACK TO THE LRV (≤ 100 METERS) AT 4.0 KM/HR, AND THE LRV RETURN TRAVERSE AT 7.3 KM/HR, AND AN OPS HI PURGE FLOW RATE OF 7.8 LBS/HR FOR INGRESS. AN ARBITRARY 10 MIN PAD WILL BE IMPOSED DURING THE LOW PURGE FLOW PHASE.
- THE WALKBACK RETURN TRAVERSE CAPABILITY REPRESENTS A PARTICULAR CONSUMABLE CONSIDERING A WALKBACK RETURN RATE OF 3.6 KM/HR FOR DISTANCES ≤ 3.6 KM AND 2.7 KM/HR FOR DISTANCES > 3.6 KM. THE BSLS RIDEBACK RETURN TRAVERSE CAPABILITY REPRESENTS 5 MIN FOR BSLS ACTIVATION AND AN LRV RATE OF 7.3 KM/HR.

(B) WALKING TRAVERSES

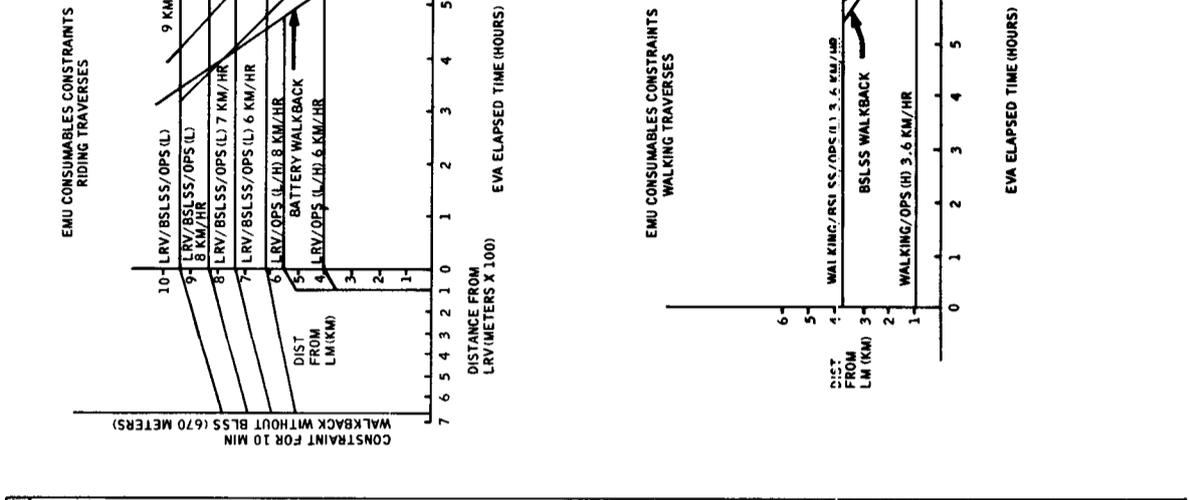
- THE WALKING/BSLS/OPS (L) RETURN TRAVERSE CAPABILITY REPRESENTS AN OPS LOW PURGE FLOW RATE OF 4.0 LBS/HR, 5 MIN FOR BSLS ACTIVATION, AND THE TIME REQUIRED FOR THE WALKING RETURN TRAVERSE.
- THE WALKING/OPS (H) RETURN TRAVERSE CAPABILITY REPRESENTS AN OPS HIGH PURGE FLOW RATE OF 7.8 LBS/HR FOR THE TIME REQUIRED FOR THE WALKING RETURN TRAVERSE.
- THE WALKBACK RETURN TRAVERSE CAPABILITY REPRESENTS THE PARTICULAR CONSUMABLE USED AT A CONTINGENCY RATE AT THE 3.6 KM/HR RETURN WALKING RATE.

6. THE PREMISSION ESTIMATES USED IN DEFINING THE OPERATIONAL ENVELOPE, BSLS RIDEBACK AND NORMAL RIDEBACK LIMITS, WILL BE UPDATED AS NECESSARY DURING THE TRAVERSE BASED ON A REAL-TIME ASSESSMENT OF MOBILITY AND CONSUMABLES.

7. PLS TOTAL LIFETIME - THE MAXIMUM PLS LIFETIME AVAILABLE AS AFFORDED BY THE MOST CONSTRAINING PLS CONSUMABLE. IT IS DETERMINED BY DIVIDING THE CONSUMABLE QUANTITY MINUS RESIDUAL BY THE PREDICTED CONSUMABLE USE RATE.

PLSS EVA LIFETIME - THE MAXIMUM POSSIBLE EVA TIME AS AFFORDED BY THE MOST CONSTRAINING PLS CONSUMABLE. IT IS DETERMINED BY SUBTRACTING 30 MINUTES (POST-EVA RESERVE) FROM THE TOTAL PLS LIFETIME.

TMAX - THE EVA TIME AT WHICH THE CREWMAN MUST BE AT THE LM AS LIMITED BY THE MOST CONSTRAINING PLS CONSUMABLE. FOR A RIDING TRAVERSE, IT IS DETERMINED BY SUBTRACTING 10 MINUTES (LRV EQUIPMENT ASSEMBLY TIME) AND 13 MINUTES (LM INGRESS TIME) FROM THE PLS EVA LIFETIME. FOR A WALKING TRAVERSE, IT IS DETERMINED BY SUBTRACTING 13 MINUTES (LM INGRESS TIME) AND 5 MINUTES (BSLS HOOKUP TIME) FROM THE PLS EVA LIFETIME.



REV

# LM CONSUMABLE REQUIREMENTS / MANAGEMENT CONTROL

9/1/72

REV

## I. RCS CONSUMABLE REQUIREMENTS

### A. GO/NO-GO'S

THE GO/NO-GO FOR EACH MISSION PHASE IS DEFINED AT THE QUANTITY REQUIRED FOR COMPLETION OF THE NOMINAL MISSION TO DOCKING PLUS OPS RESERVE. ALL GO/NO-GO'S ARE THE AVERAGE OF SYSTEM A AND B.

### B. REDLINES (AN "X" INDICATES THAT PROPELLANT IS REQUIRED FOR THE FUNCTION LISTED)

REDLINES	DOCKING	LONGEST ABORT RNDZ (DPS)	STAGING	BRAKING	ASCENT	LONGEST LOS FOR CSM RESCUE	TWEAK	1 REV CSM RNDZ	OPS RESERVE
UNDOCKING TO CIR	X								X
CIRC TO PDI	X	X	X	X					X
PDI TO T/D	X			X	X	X			X
LUNAR STAY	X			X	X	X			X
ASC TO TWEAK	X				X		X	X	X
TWEAK TO TPF	X							X	X
TPF TO DOCKING									X

ALL REDLINES REQUIRE A PERCENT READING ON EACH INDIVIDUAL SYSTEMS GAGE (OR AN EQUIVALENT OF PROPELLANT IF THE GAGE HAS FAILED) EQUAL TO OR GREATER THAN THE REDLINE VALUE.

### C. OPS RESERVE

1. AFTER COMMITTING TO A RENDEZVOUS BUT PRIOR TO TPF, THE OPS RESERVE IS THAT QUANTITY OF RCS PROPELLANT REQUIRED FOR ONE REV OF LOS TRACKING OF THE CSM (LM STAGED) OR 2.5 PERCENT.
2. AFTER TPF, THE OPS RESERVE IS THAT QUANTITY OF RCS PROPELLANT REQUIRED FOR A CSM ACTIVE DOCKING OR 1.0 PERCENT.

## II. PROPULSION PROPELLANT GAGING

### A. DPS

1. PRIME METHOD--PQGS TM AND ONBOARD (1.3 PERCENT).
2. BACKUP METHOD--GROUND MASS CALCULATION (3 PERCENT)

### B. APS

1. PRIME METHOD--APS QUANTITY FROM LGC MASS CALCULATION (3 PERCENT)
2. BACKUP METHOD-- FLOW RATE TIMES ELAPSED TIME (5 PERCENT)

### C. RCS

1. PRIME METHOD--GROUND RCS PROGRAM (6 PERCENT)
2. BACKUP METHOD--PQMD (ONBOARD READOUT 13 PERCENT, GROUND READOUT 10 PERCENT)

## III. CONSUMABLES MANAGEMENT

### A. RCS

THE RCS SYSTEM SHOULD BE CROSSFED WHEN NECESSARY TO INSURE NEITHER SYSTEM EXCEEDS ITS RCS CONSUMABLE REDLINE.

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS

R	ITEM															
	4-1	<p style="text-align: center;"><u>GENERAL</u></p> <p><u>GENERAL</u></p> <p>A. THE FOLLOWING PRELAUNCH REQUIREMENTS DEFINE THE MCC/MSFN REQUIREMENTS WHICH MUST BE MET BEFORE A "GO" IS GIVEN FOR LAUNCH. ALL RANGE SAFETY OFFICER REQUIREMENTS ARE CONTAINED IN SECTION 5.</p> <p>B. WHEN A SPECIFIC HARDWARE ITEM OR OPERATIONAL CAPABILITY IS DEFINED AS A MANDATORY ITEM, THE HARDWARE AND/OR SOFTWARE INTERFACE REQUIRED TO PROVIDE THE MANDATORY FUNCTIONS OF THAT HARDWARE ITEM OR OPERATIONAL CAPABILITY ARE TO ASSUME A MANDATORY STATUS ALSO.</p> <p>C. WHERE REDUNDANCY EXISTS FOR MANDATORY ITEMS, A BACKUP CAPABILITY IS CONSIDERED HIGHLY DESIRABLE.</p> <p style="text-align: center;"><u>NOTE</u></p> <p>THE VARIOUS EQUIPMENT LISTINGS IN THIS SECTION ARE TO BE UTILIZED AS A GUIDE ONLY. IT IS MANDATORY, PRIOR TO COMMITTING THE MISSION TO LAUNCH, TO BE ABLE TO:</p> <p>A. RECEIVE AND DISPLAY TELEMETRY AND TRACKING DATA</p> <p>B. MAINTAIN VOICE COMMUNICATIONS WITH THE CREW</p>														
		<table border="1"> <thead> <tr> <th>MISSION</th> <th>REV</th> <th>DATE</th> <th>SECTION</th> <th>GROUP</th> <th>PAGE</th> <th></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>GROUND INSTR REQUIREMENTS</td> <td>GENERAL</td> <td>4-1</td> <td style="text-align: right;">Tape 13.1</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	GENERAL	4-1	Tape 13.1
MISSION	REV	DATE	SECTION	GROUP	PAGE											
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MISSION RULES

SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				<u>MCC</u>				
	4-2	<u>TELEMETRY</u> A. CONSOLE DISPLAY (D/TV, EVENTS, ANALOGS) B. PCM GROUND STATIONS (4) C. RECORDING AND PLAYBACK 1. ALDS 2. MSFN	PRELAUNCH PRELAUNCH PRELAUNCH	MANDATORY 2 OF 4 MANDATORY, 2 HIGHLY DESIRABLE DESIRABLE	A. FOR DISPLAY OF MANDATORY S/V PARAMETERS B. FOR DISPLAY OF MANDATORY S/V EVENTS AND ANALOGS			
	4-3	<u>COMMAND</u> A. MOCR TOGGLE SWITCHES (BOTH A AND B) 1. BSE ABORT REQUEST 2. FIDO ABORT REQUEST 3. FD ABORT REQUEST B. COMMAND PANELS: INCO, GUIDO, BSE, CCATS C. MOCR CONSOLE/SITE SELECT CAPABILITY 1. RTC CONSOLE (CCATS) 2. CCATS CMD CONSOLE MED D. FC/M&O SWITCHING CAPABILITY 1. CCATS 2. CCATS CMD MED E. ABORT/CCATS TEST SWITCHING CAPABILITY 1. FD CONSOLE 2. CCATS CMD MED	PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	A. FOR LAUNCH PHASE ABORT REQUEST			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	MCC	4-2	Tape 13.2

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## MISSION RULES

### SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	4-4	<u>TRAJECTORY</u> A. TRAJECTORY DATA PROCESSING  1. AVAILABILITY OF ONE INDEPENDENT TRACKING SOURCE (IPR, USB) FROM LIFTOFF TO T+10 MINUTES  2. IU AND CMC TM VECTORS FROM LIFTOFF TO INSERTION  B. RTCC - DATA SELECT CAPABILITY	PRELAUNCH  PRELAUNCH  PRELAUNCH	1 MANDATORY  BOTH MANDATORY  MANDATORY	A. THE TRAJECTORY DATA SOURCES ARE UTILIZED AS FOLLOWS:  1. (A) INDEPENDENT VERIFICATION OF L/V NAVIGATION  (B) PROTECTION AGAINST VIOLATION OF LAUNCH ENVELOPE  A. 2. REQUIRED FOR ORBIT GO/NO-GO  B. TO SELECT BEST AVAILABLE DATA SOURCE				
	4-5	<u>COMMUNICATIONS</u> A. MOCR:  AFD CONF LOOP FD LOOP  MOCR DYN MOCR SYS 1 & 2 A/G 1 LOOP A/G 2 LOOP  B. MCC/LAUNCH COMPLEX:  121 CLTC 111 CVTS 212 MSTC  C. MCC/RSO:  FD LINE TO RSO RSO PRIVATE LINE CAPE 111 RSO LOOP  D. MCC/REMOVED SITES:  ONE A/G PATH	PRELAUNCH  PRELAUNCH  PRELAUNCH  PRELAUNCH  PRELAUNCH	1 OF 2 MANDATORY  ALL HIGHLY DESIRABLE  1 OF 3 MANDATORY  1 OF 3 MANDATORY  MANDATORY	A. FOR MISSION CONTROL     B. FOR TERMINAL COUNT COORDINATION OF MCC-PAD ACTIVITIES   C. FOR TRAJECTORY VERIFICATION AND BOOSTER SAFING   D. USED FOR COMMUNICATION WITH CREW				
	4-6	<u>COMPUTER</u> A. MOC (IBM 360/75)  B. DSC (IBM 360/75)  C. CCATS (UNIVAC 494)- ONLINE  CCATS (UNIVAC 494)- STANDBY	PRELAUNCH  PRELAUNCH  PRELAUNCH	MANDATORY  HIGHLY DESIRABLE  1 MANDATORY AND 1 HIGHLY DESIRABLE	TO PROCESS MANDATORY S/V PARAMETERS AND TRAJECTORY DATA  AN SSC (IBM 360/75) IS AVAILABLE AS BACKUP TO THE MOC OR DSC.  TO THROUGH PROCESS MANDATORY S/V PARAMETERS TO MOC				
	4-7	<u>TIMING</u>  MITE (2)	PRELAUNCH	1 MANDATORY	MCC TIMING STANDARD TO SUPPORT MANDATORY RTCC/CCATS COMPUTERS				
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	MCC	4-3	Tape 13.3



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MISSION RULES

SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	4-9 (CONT)	10. GUIDO ANALOG CHART RECORDERS ONE AND TWO  11. INSERTION/INJECTION DIGITALS  C. ADEG CHANNELS 90-93 D. VSM E. AUX VSM F. EIDOPHORS (3)  NOTE: INDIVIDUAL FLIGHT CONTROLLERS WILL BE RESPONSIBLE FOR REPORTING LOSS OF DISPLAY CAPABILITY OF MANDATORY PARAMETERS TO THE FLIGHT DIRECTOR.	PRELAUNCH  PRELAUNCH  PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH	HIGHLY DESIRABLE ON TV  MANDATORY ON D/TV  HIGHLY DESIRABLE MANDATORY HIGHLY DESIRABLE 2 HIGHLY DESIRABLE	11. FOR G&N GO/NO-GO  C. FOR DSC DISPLAYS  D. FOR D/TV. IF MANDATORY CHANNELS CAN BE DISPLAYED, THE VSM IS HD FOR LAUNCH PROVIDED THE ETO IS LESS THAN 1 HOUR			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	MCC	4-5	Tape 13.5

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## MISSION RULES

### SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				<u>GSFC/KSC/MSFN</u>				
	4-10	<u>GSFC</u> A. GSFC UNIVAC-494 (2) COMMUNICATIONS PROCESSOR B. WBD (50.0 KBPS) LINES (2) BETWEEN MCC AND GSFC C. TTY CIRCUITS BETWEEN MCC AND GSFC 1. OUTGOING 2. INCOMING (JJ)	PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH	1 MANDATORY 1 MANDATORY 1 OF 32 CIRCUITS HIGHLY DESIRABLE 1 OF 32 CIRCUITS MANDATORY	A. ONE UNIVAC-494 CAN PERFORM ALL NECESSARY FUNCTIONS, THE SECOND ONE IS BACKUP. B. EITHER LINE CAN BE SWITCHED TO EITHER UNIVAC-494. C. VFTG PROVIDES TWO REDUNDANT 16 CIRCUIT TTY CHANNELS. 1. FOR ACQ MSG, LS CMD 2. FOR RECEPTION OF LOWSPEED RADAR DATA.			
	4-11	<u>KSC</u> TELEMETRY: A. VHF TM FROM THE FOLLOWING FOR S-II, S-IVB, AND IU: 1. CIF ANTENNA 2. MILA VHF ANTENNA B. USB TM FROM THE FOLLOWING: 1. MILA USB 2. CIF USB COMMAND: THIS CAPABILITY IS DEFINED UNDER GSFC/KSC/MSFN COMMAND RULE 4-12 FOR LAUNCH COVERAGE. TRACKING: THAT CAPABILITY REQUIRED TO SATISFY RULE 4-4 (TRAJECTORY) IS MANDATORY. VOICE COMMUNICATIONS: THIS KSC CAPABILITY IS DEFINED UNDER MCC RULE 4-5 (COMMUNICATIONS).	PRELAUNCH PRELAUNCH	1 HIGHLY DESIRABLE 1 MANDATORY	A. THESE ANTENNAS CAN BE SWITCHED TO MILA OR CIF FACILITIES B. USB IS THE CSM'S ONLY SOURCE OF DATA.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	GSFC/KSC/MSFN	4-6	Tape 14.1



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MISSION RULES

SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	4-13	<u>GENERAL ORBITAL COVERAGE</u> IT IS REQUIRED THE MSFN HAVE THE CAPABILITY OF PROVIDING THE MCC THE MINIMUM MISSION CONTROL SUPPORT LISTED BELOW OF TWO MSFN USB SITES PER REVOLUTION THROUGH REVOLUTION 3.  A. CMD CCS CSM USB  B. TELEMETRY S-IVB VHF (CP-1) IU CCS (DP-1B) IU VHF (DP-1) CSM USB  C. TRACK C-BAND USB  D. A/G COMMUNICATIONS VHF USB	PRELAUNCH PRELAUNCH  PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE  HIGHLY DESIRABLE 1 OF 2 MANDATORY MANDATORY  HIGHLY DESIRABLE MANDATORY  1 OF 2 MANDATORY	DOWNLINKS REQUIRED TO RECOVER S-IVB DATA.          USB MANDATORY AT LEAST ONE STATION PRIOR TO TLI TO CONFIRM ONBOARD CSM USB A/G CAPABILITY.			
	4-14	<u>POST S/C SEPARATION</u> IT IS MANDATORY THAT 1 SITE PROVIDE THE FOLLOWING CAPABILITIES:  A. TLM - CCS  B. CMD - CCS	PRELAUNCH PRELAUNCH	MANDATORY MANDATORY	A. TO PROVIDE TM FOR DETERMINING S-IVB STATUS BEYOND VHF RANGE. B. TO PROVIDE CORRECTIVE COMMAND CAPABILITY FOR S-IVB BULKHEAD DELTA PROBLEMS. C. BOTH OF THE ABOVE ARE REQUIRED TO INSURE CREW SAFETY AND LM EXTRACTION.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	GSFC/KSC/MSFN	4-8	Tape 14.3

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## MISSION RULES

### SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	4-15	<u>HSK, GDS, MAD</u>  IT IS MANDATORY 2 OF 3 OF THESE SITES PROVIDE THE FOLLOWING CAPABILITIES:  A. TM      USB B. TRACK    USB C. VOICE    USB D. CMD      USB	PRELAUNCH PRELAUNCH PRELAUNCH PRELAUNCH	MANDATORY MANDATORY MANDATORY HIGHLY DESIRABLE	A. TO COVER TRANSLUNAR COAST AND LPO
	4-16	<u>RIOMETER NETWORK SITES</u>  GWM. IMA	PRELAUNCH	HIGHLY DESIRABLE	

	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	GSFC/KSC/MSFN	4-9	Tape 14.4

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## MISSION RULES

### SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONTINUED

R	ITEM							
	4-17	<p><u>INTRODUCTION TO SITE FAILURE DECISION MATRIX</u></p> <p>FOR PRELAUNCH FAILURES OF LAUNCH PHASE SITE CAPABILITY, THE FOLLOWING DECISION MATRIX APPLIES THE LAUNCH PHASE GROUND INSTRUMENTATION REQUIREMENTS TO THE RESULTING DEGRADED COVERAGE.</p> <p>THIS MATRIX POINTS OUT THE LOSS OF CONTINUOUS COVERAGE BETWEEN LIFTOFF AND INSERTION PLUS 60 SECONDS FOR VARIOUS SITE FAILURES. IF SITE FAILURES OCCUR PRIOR TO LAUNCH, THE MATRIX WILL BE USED TO DETERMINE WHETHER MANDATORY CONTINUOUS COVERAGE HAS BEEN LOST.</p> <p>(NOMINAL INSERTION IS 11:55)</p> <p>TO USE THE MATRIX:</p> <p>A. LOOK FOR AN X UNDER THE COLUMN FOR SITE WHERE THE FAILURE OCCURRED.</p> <p>B. GO ACROSS TO THE COLUMN FOR THE CAPABILITY THAT WAS LOST AND READ THE DECISION.</p> <p>C. THE COVERAGE THAT WAS LOST IS IN THE COLUMN LABELED "APPROXIMATE MANDATORY COVERAGE LOST."</p> <p>D. MORE THAN ONE X IN A ROW SPECIFIES A FAILURE OF THE SAME CAPABILITY AT MORE THAN ONE SITE.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	GSFC/KSC/MSFN	4-10	Tape 14.5

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONCLUDED

R	ITEM									
		SITES FAILED				APPROXIMATE MANDATORY COVERAGE LOST FOR NO-GO ITEMS FOR ALL LAUNCH AZIMUTHS	CAPABILITY LOST			
		ALDS TM	MIL/ CAPE	BDA	VAN		TM	CMD	TRACK	A/G
		00:00 TO 08:49	00:00 TO 08:49	04:10 TO 12:40	09:10 TO 16:05		USB OR CCS AND VHF	USB AND CCS	BOTH S AND C BAND	USB AND VHF
	S I N G L E  S I T E  F A I L U R E	X				NONE SEE NOTE 1	GO	N/A	N/A	N/A
			X			00:00 TO 04:10 SEE NOTE 2	GO	GO	NO-GO	NO-GO
				X		08:49 TO 09:10 SEE NOTE 3	GO	GO	GO	GO
					X	NONE	GO	GO	GO	GO
	M U L T I P L E  S I T E  F A I L U R E S	X	X			00:00 TO 04:10	NO-GO	GO	NO-GO	NO-GO
			X	X		00:00 TO 09:10 SEE NOTE 2	GO	GO	NO-GO	NO-GO
			X		X	00:00 TO 04:10 SEE NOTE 2	GO	GO	NO-GO	NO-GO
				X	X	08:49 TO 16:05	NO-GO	GO	NO-GO	NO-GO
		X		X		08:49 TO 09:10 SEE NOTE 3	GO	GO	GO	GO
		X			X	NONE	GO	GO	GO	GO
		X	X	X		00:00 TO 09:10	NO-GO	GO	NO-GO	NO-GO

NOTES: 1. LOSS OF ALDS RESULTS IN LOSS OF S-IC TM. HOWEVER, IT IS NOT MANDATORY FOR LAUNCH.  
 2. GO ON TM BECAUSE OF ALDS DATA UNTIL 08:49.  
 3. LOSS OF COVERAGE IS NOT SEVERE ENOUGH FOR A NO-GO CONDITION.

MISSION	REV	DATE	SECTION	GROUP	PAGE
APOLLO 17	FNL	9/1/72	GROUND INSTR REQUIREMENTS	GSFC/KSC/MSFN	4-11

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE

R	ITEM	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: fit-content;">LAUNCH/TRANSEARTH</div>						
5-1	THE LAUNCH PHASE WILL BE TERMINATED FOR ANY OF THE FOLLOWING CONDITIONS:	<ul style="list-style-type: none"> <li>A. VIOLATION OF THE VEHICLE BREAKUP LINE</li> <li>B. <math>T_{FF} \leq 1:40</math> AND DECREASING AFTER TOWER JETTISON</li> <li>C. VIOLATION OF ENTRY "G" LIMIT</li> <li>D. <math>V_S</math> INCREASING</li> <li>E. OVERSPEED CONDITIONS AT INSERTION</li> <li>F. VIOLATION OF EXIT HEATING LINE</li> <li>G. IF <math>H \leq 75</math> NM AND DECREASING BEFORE ACHIEVING MODE IV CAPABILITY</li> </ul>						
5-2	THE LES WILL NOT BE JETTISONED UNTIL MODE II CAPABILITY IS ESTABLISHED BY $T_{FF} \geq 1:20$ AND INCREASING.							
5-3	MODE II, III, IV, AND APOGEE KICK	<ul style="list-style-type: none"> <li>A. THE GROUND IS PRIME FOR ABORT MODE DETERMINATION AND MODE III MANEUVER COMPUTATION. THE CREW USING THE G&amp;N, WILL BE PRIME FOR MODE IV, APOGEE KICK MANEUVERS, AND DETERMINATION OF S-IVB OVERSPEED CONDITIONS.</li> <li>B. MODE III MANEUVERS WILL BE INTERRUPTED WHEN <math>T_{FF} = 1:00</math> AND DECREASING.</li> <li>C. MODE IV MANEUVERS AND APOGEE KICK MANEUVERS WILL BE INTERRUPTED WHEN <math>T_{FF} = 1:40</math> AND DECREASING.</li> <li>D. MODE IV MANEUVERS WILL BE INTERRUPTED IF THE CURRENT ALTITUDE IS 70 NM, DECREASING, AND <math>H_p &lt; 3000</math> FT.</li> <li>E. IF ENTERING, UTILIZE LIFT TO AVOID LAND. UNAVOIDABLE LAND LANDING USE RL 90 DEG.</li> <li>F. IF NO SLA SEP OR IF SPS FAILS:                             <ul style="list-style-type: none"> <li>1. <math>H_p &lt; 40</math> - EXECUTE CM/SM SEP BY <math>T_{FF} = 1:40</math>.</li> <li>2. <math>40 &lt; H_p &lt; 70</math> - GROUND WILL DECIDE TO USE CM RCS ASAP OR A<sub>i</sub> APOGEE TO REDUCE <math>H_p</math> TO 40 NM</li> </ul> </li> </ul>						
5-4	MODE III ABORTS	<ul style="list-style-type: none"> <li>A. PREDICTED <math>T_{FF}</math> AFTER SPS C/O <math>&lt; 1:00</math>.                             <ul style="list-style-type: none"> <li>1. FULL LIFT IP ON WATER - DO NOT UBURN.</li> <li>2. G&amp;N GO AND FULL LIFT IP ON LAND - BURN TO <math>T_{FF} = 1:00</math>, RL 90 DEG.</li> <li>3. G&amp;N NO-GO AND FULL LIFT IP ON LAND - BURN A REDUCED <math>\Delta V</math> TO MAINTAIN <math>T_{FF}</math> AFTER C/O AND RL 90 DEG.</li> </ul> </li> <li>B. IF <math>\Delta TB \leq 2</math> SEC, DO NOT BURN.</li> <li>C. IF IGNITION OCCURS AFTER GETI + 10 SEC, BURN UNTIL G&amp;N <math>\Delta R = 0</math>, RL 55 DEG. (IF UNABLE TO BURN <math>\Delta R = 0</math>, RL 90 DEG.)</li> </ul>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	LAUNCH TRANSEARTH	5-1	Tape 51.6

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM															
	5-5	<p>THE S/C CMC WILL BE NO-GO FOR ABORT MANEUVER DETERMINATION AND MONITORING FOR ANY OF THE FOLLOWING:</p> <p>A. CMC PROGRAM ALARMS:</p> <p style="margin-left: 40px;">SINGLE OCCURRENCE - 00214, 00777, 01107, 01407, 04777, 07777, 10777, 13777, 14777, 00205</p> <p style="margin-left: 40px;">CONTINUOUS OCCURRENCE - 20430, 20607, 20610, 21204, 21206, 21210, 21302, 21501, 21502, 21521, 31104, 31201, 31202, 31203, 31211</p> <p>B. RTCC AND CMC <math>T_{FF}</math> DIFFERENCE OF &gt; 40 SEC.</p> <p>C. CONFIRMED ERROR IN S/C PLATFORM VELOCITY COMPONENTS OF &gt; 50 FPS IN X OR 100 FPS IN Z.</p> <p>D. CMC TRAJECTORY SOURCE INDICATES "GO" OR "NO-GO" INCONSISTENT WITH BEST TRAJECTORY SOURCE(S) INDICATION.</p>														
	5-6	<p>THE ORBIT IS "GO" IF <math>H_p \geq 70</math> NM.</p>														
	5-7	<p>ELIMINATION OF CM RCS PROPELLANTS DURING MODE I ABORTS</p> <p>A. THE CREW WILL BE ADVISED TO BURN OFF THE CM RCS PROPELLANTS IN THE EVENT OF A MODE I ABORT IF THE PREDICTED LANDING POINT IS ON LAND.</p> <p>B. FOR LOSS OF COMM WITH MCC AND MODE I ABORT BETWEEN 61 SEC GET AND 120 SEC GET THE CM RCS PROPELLANT WILL BE BURNED OFF.</p> <p>RULES 5-8 THROUGH 5-19 ARE RESERVED.</p>														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>TRAJECTORY AND GUIDANCE</td> <td>LAUNCH TRANSEARTH</td> <td>5-2</td> <td style="text-align: right;">Tape 51.7</td> </tr> </tbody> </table>			MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	LAUNCH TRANSEARTH	5-2	Tape 51.7
MISSION	REV	DATE	SECTION	GROUP	PAGE											
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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
		<u>EARTH ORBIT AND TLI</u>						
	5-20	EARTH ORBITAL ALTITUDE CONSTRAINTS:						
		A. REAL-TIME MISSION PLANNING						
		PERIGEE - 85 NM MINIMUM. MAXIMUM Hp IS DETERMINED BY SM RCS AVAILABLE FOR HYBRID DEORBIT.						
		B. CONTINGENCY						
		PERIGEE - 70 NM MINIMUM (VIOLATIONS WILL BE CORRECTED ASAP) IF Hp < 70 NM AND MANEUVER TO RAISE Hp IS NOT POSSIBLE:						
		1. 40 < Hp < 70 - EXECUTE SPS RETROGRADE ASAP UNTIL Hp < 40. IF NO SPS, LSE SM-RCS.						
		2. Hp < 40 - CM/SM SEP - RETRO WILL RECOMMEND ENTRY PROFILE.						
	5-21	RESERVED						
	5-22	S/C L/O TIME (GRR) WILL BE UPDATED WITH SRC L/U TIME IF THE TWO ARE DIFFERENT BY 10 SEC.						
	5-23	TIME BETWEEN EPO RETROFIRE GETI AND 400K MUST BE >9 MIN. IF NOT, RETARGET FOR NEXT PTP.						
	5-24	RESERVED						
	5-25	PLANNED G&N AND SCS RETROFIRE MANEUVERS WILL BE UPDATED IF:						
		A. THE COMPUTED RETROFIRE POSITION CHANGES BY >0.5° LONGITUDE PRIOR TO GETI - 30 MIN.						
		B. THE COMPUTED RETROFIRE POSITION CHANGES >2° LONGITUDE AFTER GETI - 30 MIN.						
	5-26	RESERVED						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	EARTH ORBIT AND TLI	5-3	
								Tape 16.3

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
	5-27	<p>IF SPS FAILS AFTER EPO RETROFIRE IGNITION OR NO SLA SEP :</p> <p>A. <math>H_p &gt; 70</math> NM - RETARGET FOR NEXT BEST PTP USING RCS.</p> <p>B. <math>40 &lt; H_p &lt; 70</math> - PITCH UP TO LOCAL HORIZONTAL ATTITUDE AND BURN SM RCS USING FOLLOWING PRIORITIES:</p> <ol style="list-style-type: none"> <li>1. BURN <math>H_p</math> TO PAD VALUE</li> <li>2. BURN MAXIMUM SM RCS <math>\Delta V</math> AVAILABLE</li> <li>3. BURN CM RCS TO <math>H_p = 40</math> NM IF SM RCS <math>\Delta V</math> NOT SUFFICIENT TO OBTAIN <math>H_p = 40</math> NM. IF <math>H_p \leq 40</math> NM, TERMINATE ALL THRUSTING AT <math>T_{FF} = 7</math> MIN.</li> </ol> <p>C. <math>H_p &lt; 40</math> NM - REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FOLLOWING PRIORITY:</p> <ol style="list-style-type: none"> <li>1. BURN <math>\Delta V</math> RESIDUALS.</li> <li>2. BURN MAXIMUM SM <math>\Delta V</math> AVAILABLE.</li> </ol> <p style="text-align: center;"><u>NOTE</u> THE S-IVB LOX DUMP CAPABILITY MAY BE USED TO SHAPE THE ORBIT FOR RETROFIRE MANEUVER OR TO REDUCE THE S-IVB WEIGHT TO OBTAIN MORE SM RCS <math>\Delta V</math>.</p>						
	5-28	<p>THE G&amp;N IS NO-GO FOR ENTRY IF:</p> <p>A. THE CMC VALUE OF DOWNRANGE ERROR (RP- RT) AT .2G DIFFERS <math>&gt; \pm 100</math> NM FROM GROUND VALUE. CREW B. V AND VTY.</p> <p>B. V AND GAMMA AT 400K ARE OUTSIDE THE CORRIDOR. GROUND WILL PROVIDE ENTRY PROFILE.</p>						
	5-29	<p>BOOSTER NAVIGATION AND TARGET UPDATES FOR TLI:</p> <p>A. AN IU NAVIGATION UPDATE WILL BE PERFORMED (AND TIME TAGGED TO INSURE INCORPORATION OVER A MSFN STATION PRIOR TO TB6 INITIATION) FOR THE FOLLOWING SITUATIONS:</p> <ol style="list-style-type: none"> <li>1. WHERE AN IU ACCELEROMETER FAIL OCCURRED PRIOR TO EARTH ORBIT INSERTION.</li> <li>2. FOR A FIRST OR SECOND TLI OPPORTUNITY WHERE MSFN VERSUS IU DIFFERENCE VIOLATES ANY OF THE FOLLOWING:</li> </ol> <p style="margin-left: 40px;">AT GET = 56 MIN: DOWNRANGE POSITION <math>\geq 33,101</math> FT SEMI-MAJOR <math>\geq 1.1</math> NM CROSSRANGE VELOCITY (MAXIMUM) <math>\geq 9</math> FPS</p> <p style="margin-left: 40px;">AT GET = 1 HR 45 MIN: DOWNRANGE POSITION <math>\geq 56,894</math> FT SEMI-MAJOR AXIS <math>\geq 1.21</math> NM CROSSRANGE VELOCITY (MAXIMUM) <math>\geq 9</math> FPS</p> <p>B. THERE WILL BE NO IU TARGET UPDATES FOR EITHER TLI OPPORTUNITY.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	EARTH ORBIT AND TLI	5-4	Tape 11A.2

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM															
	5-30	RESERVED														
	5-31	RESERVED														
	5-32	THE MAXIMUM ALLOWABLE MISALIGNMENT RATES BETWEEN THE IU AND IMU ARE 0.6 DEG/HR (IU) AND 1.5 DEG/HR (IMU).														
	5-33	RESERVED														
	5-34	<p>TLI UNDERBURNS</p> <p>A. FOR APOGEE ALTITUDES ABOVE 100K NM, A LUNAR LANDING MISSION IS AVAILABLE. THE TRADEOFFS THAT WILL BE MADE TO ACHIEVE THIS MISSION ARE, IN ORDER OF PRIORITY: (ITEMS ARE ADDITIVE)</p> <ol style="list-style-type: none"> <li>1. PROVIDE ADDITIONAL <math>\Delta V</math> FOR MCC BY FOREGOING ANY NOMINAL CONSTRAINTS ON TEC RETURN INCLINATION.</li> <li>2. EXECUTE MCC 1 AT TLI + 3 HRS</li> <li>3. PROVIDE ADDITIONAL <math>\Delta V</math> FOR MCC 1 BY:               <ol style="list-style-type: none"> <li>(A) UTILIZE THE LM YAW STEERING BUDGET DURING ASCENT</li> <li>(B) GIVE UP LOPC 2</li> <li>(C) ADD 24 HRS TO TEC</li> <li>(D) REOPTIMIZE THE DESCENT APPROACH AZ</li> </ol> </li> <li>4. EXECUTE MCC 1 AT TLI + 1 HR</li> <li>5. PROVIDE ADDITIONAL <math>\Delta V</math> FOR MCC 1 BY:               <ol style="list-style-type: none"> <li>(A) REOPTIMIZE TLC (INCREASE DESCENT SEA)</li> <li>(B) SCHEDULE TEI SHORTLY AFTER RNDZ</li> <li>(C) ADD 24 HRS TO TEC (MAINTAIN MISSION DURATION &lt;300 HRS)</li> <li>(D) SHORTEN THE PLANNED LUNAR STAY TIME TO ELIMINATE LOPC 1.</li> </ol> </li> </ol> <p style="text-align: center;"><u>NOTE</u> THE ADDITIONAL CAPABILITY ACHIEVED BY EACH ITEM IS HIGHLY MISSION DEPENDENT.</p> <p>B. FOR APOGEE ALTITUDES BETWEEN 100K NM AND 28,000 NM, A LUNAR ORBIT ALTERNATE MISSION IS AVAILABLE. THE NOMINAL PLAN FOR THIS MISSION IS:</p> <ol style="list-style-type: none"> <li>1. EXECUTE MCC 1 ASAP (BETWEEN TLI + 1 AND TLI + 3 HRS)</li> <li>2. EXECUTE A DPS LOI</li> <li>3. EXECUTE ALL REMAINING MANEUVERS (CIRC, LOPC, TEI) WITH THE SPS</li> </ol> <p>C. FOR APOGEE ALTITUDES BELOW 28,000 NM, AN EARTH ORBIT ALTERNATE MISSION WILL BE PERFORMED.</p>														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>TRAJECTORY AND GUIDANCE</td> <td>EARTH ORBIT AND TLI</td> <td>5-5</td> <td style="text-align: right;">Tape 51.8</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	EARTH ORBIT AND TLI	5-5	Tape 51.8
MISSION	REV	DATE	SECTION	GROUP	PAGE											
APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	EARTH ORBIT AND TLI	5-5	Tape 51.8										

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
	5-35	<p>DIFFERENCE IN CMC AND IU PLATFORM VELOCITY COMPONENTS OR TOTAL VELOCITY AT INSERTION:</p> <p>A. VIOLATION OF ANY OF THE FOLLOWING MEANS TLI IS NO-GO:</p> <p style="margin-left: 40px;"><math>\Delta\dot{X} &gt; \pm 38</math> FPS  <math>\Delta\dot{Y} &gt; \pm 73</math> FPS  <math>\Delta\dot{Z} &gt; \pm 87</math> FPS  <math>\Delta V_T &gt; \pm 34</math> FPS</p> <p>B. VIOLATION OF ANY OF THE FOLLOWING MEANS TLI IS TEMPORARILY NO-GO:</p> <p style="margin-left: 40px;"><math>\pm 7.5 &lt; \Delta\dot{X} &lt; \pm 38</math> FPS  <math>\pm 41 &lt; \Delta\dot{Y} &lt; \pm 73</math> FPS  <math>\pm 28 &lt; \Delta\dot{Z} &lt; \pm 87</math> FPS  <math>\pm 14 &lt; \Delta V_T &lt; \pm 34</math> FPS</p> <p style="text-align: center;"><u>NOTE</u>            TLI IS NO-GO UNTIL PARTS C AND 5-36            ARE DETERMINED (ORBITAL PARAMETER            DECISIONS).</p> <p>C. VIOLATION OF ANY OF THE FOLLOWING ORBITAL DECISION PARAMETERS AT GET = 1 HR 45 MIN MEANS TLI IS NO-GO.            PARAMETERS ARE IU VERSUS MSFN.</p> <p style="margin-left: 40px;">SEMI-MAJOR AXIS <math>&gt; \pm 3.28</math> NM            CROSSRANGE VELOCITY IS <math>&gt; \pm 32</math> FPS</p>						
	5-36	DIFFERENCE IN MSFN AND IU DOWNRANGE POSITION $\Delta RV > \pm 105,100$ FT AT GET = 56 MIN MEANS TLI IS NO-GO.						
	5-37	<p>WITH AN S-IVB GUID REF FAIL OR AN S-IVB ACCELEROMETER FAIL DURING LAUNCH PHASE, VIOLATION OF ANY OF THE FOLLOWING ORBITAL DECISION PARAMETERS MEANS TLI IS NO-GO. PARAMETERS ARE CMC VERSUS MSFN.</p> <p>A. DIFFERENCE IN DOWNRANGE POSITION <math>&gt; \pm 535,900</math> FEET AT GET = 56 MIN            B. DIFFERENCE IN SEMIMAJOR AXIS <math>&gt; \pm 11.6</math> NM AT GET = 1 HR 45 MIN            C. DIFFERENCE IN CROSSRANGE VELOCITY <math>&gt; \pm 78.7</math> FPS AT GET = 1 HR 45 MIN</p> <p>RULES 5-38 THROUGH 5-45            ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	EARTH ORBIT AND TLI	5-6	Tape 11A.4

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## MISSION RULES

### SECTION 5 TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM	MANEUVERS/COAST																																																	
5-46		<p>THE CMC OR LGC WILL BE TEMPORARILY NO-GO FOR MANEUVER CONTROL FOR ANY OF THE FOLLOWING:</p> <p>A. COMPUTER PROGRAM ALARMS:</p> <p style="margin-left: 40px;">SINGLE OCCURRENCE - 00205, 00214, 00777, 01107, 01407, 03777, 04777, 07777, 10/77, 13777, 14777</p> <p style="margin-left: 40px;">CONTINUOUS OCCURRENCE - 20430, 20607, 20610, 21204, 21206, 21210, 21302, 21501, 21502, 21521, 31104, 31201, 31202, 31203, 31211</p> <p>B. CMC/IMU ALIGNMENT DISCREPANCY (FOR MANEUVER EXECUTION, MONITORING, AND ORBIT DETERMINATION):</p> <ol style="list-style-type: none"> <li>1. SEXTANT STAR CHECK - AUTO OPTICS POSITIONING DOES NOT PLACE SELECTED STAR IN FIELD OF VISION OF SXT.</li> <li>2. HORIZON CHECK ERROR &gt;4 DEG FOR RETROFIRE FROM EPO.</li> </ol> <p>C. LGC/IMU ALIGNMENT DISCREPANCY INDICATE BY &gt;2 DEG FROM PREDICTED CQAS COORDINATES.</p> <p>D. DIFFERENCE BETWEEN CMC/LGC GROUND NAV CHECK AFTER A NAV UPDATE FROM GROUND IS:</p> <ol style="list-style-type: none"> <li>1. LATITUDE &gt; 0.02°</li> <li>2. LONGITUDE &gt; 0.02°</li> <li>3. H &gt; 0.2 NM</li> </ol>																																																	
5-47		<p>SPACECRAFT TIMING MUST BE MAINTAINED WITHIN THE FOLLOWING LIMITS:</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"></th> <th style="text-align: center;"><u>CMC (SEC)</u></th> <th style="text-align: center;"><u>LGC (SEC)</u></th> <th style="text-align: center;"><u>AGS (SEC)</u></th> </tr> </thead> <tbody> <tr><td>A. RETROFIRE</td><td style="text-align: center;">2</td><td style="text-align: center;">---</td><td style="text-align: center;">---</td></tr> <tr><td>B. ENTRY</td><td style="text-align: center;">2</td><td style="text-align: center;">---</td><td style="text-align: center;">---</td></tr> <tr><td>C. TLI</td><td style="text-align: center;">2</td><td style="text-align: center;">---</td><td style="text-align: center;">---</td></tr> <tr><td>D. MCC'S</td><td style="text-align: center;">2</td><td style="text-align: center;">---</td><td style="text-align: center;">---</td></tr> <tr><td>E. LOI/DOI/CIRC/LOPC</td><td style="text-align: center;">2</td><td style="text-align: center;">2</td><td style="text-align: center;">---</td></tr> <tr><td>F. TEI</td><td style="text-align: center;">2</td><td style="text-align: center;">2</td><td style="text-align: center;">---</td></tr> <tr><td>G. DESCENT</td><td style="text-align: center;">0.5</td><td style="text-align: center;">0.3</td><td style="text-align: center;">0.3</td></tr> <tr><td>H. ASCENT</td><td style="text-align: center;">0.5</td><td style="text-align: center;">0.3</td><td style="text-align: center;">0.3</td></tr> <tr><td>I. RENDEZVOUS</td><td style="text-align: center;">0.5</td><td style="text-align: center;">0.5</td><td style="text-align: center;">0.5</td></tr> <tr><td>J. SXT TRACKING</td><td style="text-align: center;">0.5</td><td style="text-align: center;">---</td><td style="text-align: center;">---</td></tr> </tbody> </table> <p style="margin-top: 20px;">RULES 5-48 THROUGH 5-55 ARE RESERVED.</p>							<u>CMC (SEC)</u>	<u>LGC (SEC)</u>	<u>AGS (SEC)</u>	A. RETROFIRE	2	---	---	B. ENTRY	2	---	---	C. TLI	2	---	---	D. MCC'S	2	---	---	E. LOI/DOI/CIRC/LOPC	2	2	---	F. TEI	2	2	---	G. DESCENT	0.5	0.3	0.3	H. ASCENT	0.5	0.3	0.3	I. RENDEZVOUS	0.5	0.5	0.5	J. SXT TRACKING	0.5	---	---
	<u>CMC (SEC)</u>	<u>LGC (SEC)</u>	<u>AGS (SEC)</u>																																																
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		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	MANEUVERS COAST	5-7																																												
						Tape 51.9																																													

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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM	
	5-56	RESERVED
	5-57	<p>TRANSLUNAR MCC EXECUTION CRITERIA</p> <p>A. MCC'S 2 AND 4 ARE PREFERRED EXECUTION POINTS. THE FIRST MIDCOURSE WILL BE DELAYED UNTIL MCC2 IF THE COST IS NOT PROHIBATIVE.</p> <p>B. MIDCOURSE CORRECTIONS WILL BE COMPUTED TO UTILIZE THE PREFERRED PROPULSION SYSTEM. THIS MAY INCLUDE NON-FREE RETURN MANEUVERS OFF OF A NOMINAL FREE RETURN TRAJECTORY.</p>
	5-58	RESERVED
	5-59	<p>LOI SHALL BE TARGETED WITHIN THESE CONSTRAINTS:</p> <p>A. THE PERICYNTHION OF THE APPROACH HYPERBOLA WILL BE MAINTAINED WITHIN <math>\pm 10</math> NM OF <math>H_p</math> TARGET.</p> <p>B. THE ALTITUDE OF THE NODE (BETWEEN THE APPROACH HYPERBOLA AND THE DESIRED LPO) WILL BE MAINTAINED BETWEEN -10 AND +15 NM OF <math>H_p</math> TARGET.</p>
	5-60	<p>A "GO" FOR LOI REQUIRES THE FOLLOWING:</p> <p>A. COMMITMENT TO AT LEAST 4 HRS IN LPO (PROVIDES ONE REV OF TRACK AFTER LOI FOR CALCULATION OF TEI).</p> <p>B. ADEQUATE FUEL REMAINING FOR SUBSEQUENT LUNAR ORBIT OPERATIONS (MINIMUM IS TEI AND TEC MCC'S)</p>

	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	MANEUVERS COAST	5-8	Tape 17.1

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM																		
	5-61	<p>PREMATURE LOI SHUTDOWN FOR SPS PROBLEMS (LOI ABORT MODES)</p> <p>A. SHUTDOWN IN MODE I REGION -</p> <p>EXECUTE A DPS 2-HR DIRECT ABORT FOR:            LOI BURN TIME FROM 0 TO 0:32            LOI <math>\Delta V_M</math> FROM 0 TO 207</p> <p>EXECUTE A DPS 30-MIN DIRECT ABORT FOR:            LOI BURN TIME FROM 0:32 TO 0:53            LOI <math>\Delta V_M</math> FROM 207 TO 3 + 48</p> <p>EXECUTE A DPS TO DEPLETION 30-MIN DIRECT ABORT FOLLOWED BY A SUPPLEMENTARY APS BURN 2 HRS LATER:            LOI BURN TIME FROM 0:53 TO 1:31            LOI <math>\Delta V_M</math> FROM 348 TO 613</p> <p>B. SHUTDOWN IN MODE II REGION -</p> <p>EXECUTE A DPS + APS 2-IMPULSE CIRCUMLUNAR ABORT WITH APS BURN TO SUPPLEMENT DPS BURN TO DEPLETION DURING SECOND IMPULSE (APS BURN IS TWO HOURS AFTER DPS BURN) FOR:            LOI BURN TIME FROM 1:31 TO 2:03            LOI <math>\Delta V_M</math> FROM 613 TO 833</p> <p>EXECUTE A DPS 2-IMPULSE CIRCUMLUNAR ORBIT:            LOI BURN TIME FROM 2:03 TO 2:54            LOI <math>\Delta V_M</math> FROM 833 TO 1200</p> <p>C. SHUTDOWN IN MODE III REGION -</p> <p>EXECUTE TEI (SPS OR DPS) AT NEXT OPPORTUNITY OR INITIATE AN ALTERNATE MISSION:            LOI BURN TIME FROM 2:54 TO 6:35            LOI <math>\Delta V_M</math> FROM 1200 TO 2980            (FOR APOLLO 17 APS IS REQUIRED TO SUPPLEMENT DPS FOR LOI BURN TIME FROM 4:30 TO 6:35)</p> <p style="text-align: center;"><u>NOTES</u></p> <ol style="list-style-type: none"> <li>1. ALL ABORT MANEUVERS ARE MCC-H TARGETED EXCEPT FOR THE DPS 30-MIN ABORT WHICH IS TAKEN FROM THE CREW CHART</li> <li>2. CONTROL LIMITS APPLY AS FOLLOWS:</li> </ol> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>LOI BURN TIME</u></th> <th style="text-align: left;"><u>LOI DELTA VM</u></th> <th style="text-align: left;"><u>LIMITS</u></th> </tr> </thead> <tbody> <tr> <td>0 TO 0:53</td> <td>0 TO 348</td> <td>TIGHT</td> </tr> <tr> <td>0:53 TO 3:40</td> <td>348 TO 1543</td> <td>LOOSE</td> </tr> <tr> <td>3:40 TO 6:35</td> <td>1543 TO 2980</td> <td>TIGHT</td> </tr> </tbody> </table> <p>RULES 5-62 THROUGH 5-75 ARE RESERVED.</p>						<u>LOI BURN TIME</u>	<u>LOI DELTA VM</u>	<u>LIMITS</u>	0 TO 0:53	0 TO 348	TIGHT	0:53 TO 3:40	348 TO 1543	LOOSE	3:40 TO 6:35	1543 TO 2980	TIGHT
<u>LOI BURN TIME</u>	<u>LOI DELTA VM</u>	<u>LIMITS</u>																	
0 TO 0:53	0 TO 348	TIGHT																	
0:53 TO 3:40	348 TO 1543	LOOSE																	
3:40 TO 6:35	1543 TO 2980	TIGHT																	
		MISSION	REV	DATE	SECTION	GROUP	PAGE												
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	MANEUVERS COAST	5-9	Tape 17.2											

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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
		<u>LUNAR ORBIT</u>						
5-76		THE DOI <sub>1</sub> MANEUVER WILL BE TARGETED TO OPTIMIZE THE GROUND TRACK FOR LUNAR LANDING.						
		<p><u>NOTE</u></p> <p>THE TARGETED <math>H_p</math> IN REV 12 IS 80K FT.</p>						
5-77		A "GO" FOR DOI REQUIRES COMMITMENT TO AT LEAST 4 HRS IN LUNAR ORBIT.						
		<p><u>NOTE</u></p> <p>THIS PROVIDES ONE FULL REV OF TRACK AFTER DOI FOR CALCULATION OF TEI</p>						
5-78		AFTER AOS FOLLOWING DOI <sub>1</sub> , EXECUTION OF THE BAILOUT ABORT MANEUVER WILL BE RECOMMENDED IF INCOMING MSFN RADAR DATA INDICATES A CLOSEST APPROACH ALTITUDE OF EQUAL TO OR LESS THAN 1.0 NM ABOVE THE LUNAR TERRAIN.						
		<p><u>NOTES</u></p> <ol style="list-style-type: none"> <li>1. THE PERICYNTHION ALTITUDE WHICH CORRESPONDS TO 1.0 NM CLOSEST APPROACH IS <u>3.38 NM</u>.</li> <li>2. THE VALUE OF DOPPLER RESIDUALS AT AOS WHICH CORRESPONDS TO THIS PERICYNTHION IS APPROXIMATELY <u>-106</u> CYCLES PER SEC BUT THE ACTUAL VALUE WILL BE DETERMINED IN REAL TIME.</li> </ol>						
5-79		PRIOR TO UNDOCKING, CSM MANEUVERS WILL BE SCHEDULED ASAP TO CORRECT THE FOLLOWING SITUATIONS:						
		<p>A. MISS DISTANCE OVER THE LLS GREATER THAN 0.5 DEG OUT OF PLANE</p> <p>B. DEVIATION IN APPROACH AZIMUTH GREATER THAN <math>\pm 10</math> DEG FROM THE NOMINAL</p> <p>C. CURRENT PERICYNTHION ALTITUDE LESS THAN 30,000 FT</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	LUNAR ORBIT	5-10	Tape 57.2

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM						
	5-80	RESERVED					
	5-81	RESERVED					
	5-82	<p>THE FOLLOWING CRITERION APPLY TO DOI<sub>2</sub>:</p> <p>A. VOICE CONFIRMATION OF CIRC IS REQUIRED FOR EXECUTION.</p> <p>B. DOI<sub>2</sub> WILL BE SCHEDULED AT LEAST 2 MIN AFTER CIRC.</p> <p>C. LM RCS BURN TIME WILL BE <math>\leq</math> 30 SEC.</p> <p>D. TARGETED PERILUNE AT PDI WILL BE NO LESS THAN 40K FT.</p>					
	5-83	AN UPDATE TO THE LLS WILL BE PROVIDED THE CREW DURING PDI TO CORRECT ANY DOWNRANGE ERRORS THAT HAVE ACCUMULATED IN THE LGC ESTIMATE OF POSITION PROVIDING THIS UPDATE IS NO LESS THAN 1000 FT NOR MORE THAN 35,000 FT.					
	5-84	THE CIRCULARIZATION MANEUVER WILL BE TARGETED TO ACHIEVE A CIRCULAR ORBIT AT RENDEZVOUS AND AN ORBITAL PERIOD THAT MAINTAINS THE CSM SOLO TIMELINE.					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	LUNAR ORBIT	5-11
							Tape 57.3

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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM								
	5-85	<p>A. THE LLS LANDMARK SIGHTINGS WILL BE CONSIDERED ACCEPTABLE IF THE PREMISSION LLS POSITION IS CHANGED BY LESS THAN:</p> <p><math>\phi \leq 7,900</math> FT (CROSSTRACK LIMIT MAY BE UPDATED IN FLIGHT BASED ON QUALITY OF TRACKING DATA.)</p> <p><math>\lambda \leq 3,800</math> FT</p> <p><math>R \leq 4,350</math> FT</p> <p>B. POWERED DESCENT WILL NOT BE SLIPPED TO ACHIEVE AN ACCEPTABLE SET OF LANDMARK SIGHTINGS.</p>							
	5-86	<p>ALLOWABLE MISALIGNMENT AT PDI IS 0.6 DEG ABOUT THE Y AXIS. IF THE SECOND P52 ALIGNMENT DETECTS DRIFT RATES INDICATIVE OF GREATER MISALIGNMENT, PDI WILL BE SLIPPED ONE REV IF NEW COMPENSATION CANNOT BE IMMEDIATELY APPLIED.</p> <p>RULES 5-87 THROUGH 5-89 ARE RESERVED.</p>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE		
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	LUNAR ORBIT	5-12	Tape 52.2	



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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM													
	5-91	<p>POWERED DESCENT WILL BE TERMINATED FOR THE FOLLOWING:</p> <p>A. PGNS NAVIGATION ERRORS, CONFIRMED BY MSFN OR DOPPLER RESIDUALS, THAT RESULT IN THE FOLLOWING AGS-PGNS DIFFERENCES:</p> <p style="margin-left: 40px;"><math>\Delta\dot{X}</math> (DOWNRANGE) &gt; +90 OR -35 FPS  <math>\Delta\dot{Y}</math> (CROSSRANGE) &gt; <math>\pm 90</math> FPS  <math>\Delta\dot{Z}</math> (RADIAL) &gt; +60 OR -35 FPS</p> <p>B. PGNS NAVIGATION ERRORS, CONFIRMED BY DOPPLER RESIDUAL BUT NOT BY AGS, THAT RESULT IN THE FOLLOWING MSFN-PGNS VELOCITY DIFFERENCES:</p> <p style="margin-left: 40px;"><math>\Delta\dot{Y}</math> (CROSSRANGE) &gt; <math>\pm 200</math> FPS  <math>\Delta\dot{Z}</math> (RADIAL) &gt; <u>+45</u> OR -35 FPS</p> <p>C. COMMANDED THRUST INCREASING PRIOR TO THROTTLEDOWN OR P63 <math>T_{G0} = 80</math> SECONDS</p> <p>D. GTC GREATER THAN 57 PERCENT BY P63/P64 PROGRAM SWITCH PLUS 15 SECONDS</p> <p>E. FAILURE TO ACHIEVE FTP (AUTO OR MANUAL) BY NOMINAL <math>T_{IG} + 31</math> SECONDS (ABORT AT GTC DIVERGENCE)</p> <p>F. THE FOLLOWING PGNS ALARMS: 20105, 00214, 20430, 20607, 21103, 01107, 21204, 21302, 21501, 00402 (CONTINUING)</p> <p>G. CONSIDERATION WILL BE GIVEN TO ABORTING FOR VIOLATION OF THE TIME BAISED DPS ABORT BOUNDARY.</p>												
	5-92	<p>THE DESCENT TARGET POINT WILL BE SHIFTED DOWNTRACK IF GTC INDICATES NO THROTTLEDOWN BY P63/64 PROGRAM SWITCH - THE MAXIMUM SHIFT IS AS FOLLOWS:</p> <p>A. 20,000 FT DOWNTRACK IF VALID LANDMARK SIGHTINGS WERE OBTAINED.</p> <p>B. 10,000 FT DOWNTRACK IF NO VALID LAND</p> <p>C. NO DOWNTRACK SHIFT WILL BE ALLOWED IF THE APPROACH AZIMUTH IS BETWEEN 95 AND 100 DEG</p> <p style="text-align: center;"><u>NOTE</u> ONE MINUTE OF RCS WILL BE USED TO ALLOW LANDING WITHIN THE ABOVE LIMITS.</p>												
	5-93	AN ABORT WILL NOT BE REQUESTED FOR A PGNS FAILURE AFTER PITCHOVER IN THE APPROACH PHASE.												
	5-94	<p>IN THE EVENT MSFN AND DOPPLER DATA ARE NOT AVAILABLE FOR CONFIRMATION OF PGNS/AGS ERRORS, POWERED DESCENT WILL BE TERMINATED FOR THE FOLLOWING AGS-PGNS VELOCITY DIFFERENCES:</p> <p style="margin-left: 40px;"><math>\Delta\dot{X} &gt; -35</math> FPS  <math>\Delta\dot{Z} &gt; +60</math> FPS OR -35 FPS</p>												
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">MISSION</th> <th style="width: 5%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>TRAJECTORY AND GUIDANCE</td> <td>LUNAR ORBIT</td> <td>5-14</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE	APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	LUNAR ORBIT	5-14
MISSION	REV	DATE	SECTION	GROUP	PAGE									
APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	LUNAR ORBIT	5-14									

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
	5-95	<p>IN THE EVENT MSFN, DOPPLER, AND AGS NAV DATA ARE NOT AVAILABLE FOR MONITORING OF POWERED DESCENT, AN ABORT WILL BE PERFORMED IF LR DATA IS NOT INCORPORATED INTO THE PGNS BY 7 MIN.</p> <p>RULES 5-96 THROUGH 5-100 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	LUNAR ORBIT	5-15	Tape 52.5

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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
		<u>ASCENT</u>						
5-101	LM LIFTOFF WILL BE DELAYED ONE REVOLUTION RATHER THAN ACCEPTING A SLIP IN NOMINAL LIFTOFF TIME GREATER THAN							
	A. 10 SECONDS FOR THE DIRECT RNDZ TECHNIQUE							
	B. 90 SECONDS FOR THE COELLIPTIC SEQUENCE RNDZ							
5-102	FOLLOWING A DESCENT ABORT, GUIDANCE SWITCHOVER TO AGS WILL BE PERFORMED FOR							
	A. THE FOLLOWING PGNS ALARMS: 20105, 00214, 20430, 20607, 21103, 01107, 21204, 21302, AND 21501							
	B. PGNS NAVIGATION ERRORS THAT RESULT IN:							
	1. AGS PREDICTED INSERTION $H_p$ < 40,000 FEET.							
	2. AGS PREDICTED INSERTION $H_a$ GREATER THAN TARGET VALUE PLUS 40 NAUTICAL MILES.							
	3. AGS PREDICTED INSERTION WEDGE ANGLE GREATER THAN 1.0 DEGREE.							
5-103	DURING ASCENT, GUIDANCE SWITCHOVER TO AGS WILL BE PERFORMED FOR							
	A. THE FOLLOWING PGNS ALARMS: 20105, 00214, 20430, 20607, 21103, 01107, 21204, 21302, AND 21501							
	B. PGNS NAVIGATION ERRORS, CONFIRMED BY AGS RESIDUALS, THAT RESULT IN THE FOLLOWING MSFN-PGNS VELOCITY DIFFERENCES:							
	$\Delta \dot{X}$ (DOWNRANGE) > $\pm 24$ FPS							
	$\Delta \dot{Y}$ (CROSSRANGE) > $\pm 90$ FPS (COELLIPTIC SEQUENCE RENDEZVOUS), > $\pm 45$ FPS (DIRECT RENDEZVOUS)							
	$\Delta \dot{Z}$ (RADIAL) > $\pm 37$ FPS							
	C. PGNS NAVIGATION ERRORS THAT RESULT IN							
	1. AGS PREDICTED INSERTION $H_p$ < 40,000 FEET.							
	2. AGS PREDICTED INSERTION $H_a$ GREATER THAN TARGET VALUE PLUS 40 NAUTICAL MILES.							
	3. AGS PREDICTED INSERTION WEDGE ANGLES GREATER THAN 1.0 DEGREE (COELLIPTIC SEQUENCE RENDEZVOUS), GREATER THAN 0.5 DEG (DIRECT RENDEZVOUS)							
	D. IF MSFN NOT VALID DURING ASCENT THE FOLLOWING DOPPLER RESIDUALS WILL BE USED TO CONFIRM SWITCHOVER:							
	1.(A). AGS-PGNS $\Delta \dot{Y}$ (CROSSRANGE) > $\pm 45$ FPS AND DOPPLER-PGNS RESIDUAL > $\pm 8.0$ FPS FOR THE DIRECT RNDZ							
	(B). AGS-PGNS $\Delta \dot{Y}$ (CROSSRANGE) > $\pm 90$ FPS AND DOPPLER-PGNS RESIDUAL > $\pm 16.0$ FPS FOR THE COELLIPTIC RNDZ							
	2. AGS-PGNS $\Delta \dot{Z}$ (RADIAL) > $\pm 37$ FPS AND DOPPLER-PGNS RESIDUAL > $\pm 32.0$ FPS							
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	ASCENT	5-16	Tape 11D.4

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM						
	5-104	DURING ASCENT, THE AGS WILL BE DECLARED NO-GO FOR CONFIRMED AGS NAVIGATION ERRORS THAT RESULT IN  A. PGNS PREDICTED INSERTION $H_p < 30,000$ FT. B. PGNS PREDICTED INSERTION $H_a$ GREATER THAN TARGET VALUE PLUS 40 NM C. PGNS PREDICTED INSERTION WEDGE ANGLE GREATER THAN 1.0 DEGREE (COELLIPTIC SEQUENCE RENDEZVOUS), GREATER THAN 0.5 DEG (DIRECT RENDEZVOUS)					
	5-105	THE GROUND WILL NOT REQUEST SWITCHOVER AFTER AGS $T_{60} < 30$ SEC.  RULE NUMBERS 5-106 THROUGH 5-110 ARE RESERVED					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	ASCENT	5-17
							Tape 18.2

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
		<u>RENDEZVOUS</u>						
5-111		<p>THE PGNS IS PRIME FOR EITHER THE DIRECT RNDZ (TPI ONLY) OR THE COELLIPTIC SEQUENCE (CSI,CDH, AND TPI) MANEUVER COMPUTATION/EXECUTION WITH THE AGS AS BACKUP UTILIZING THE ACCEPTED SOLUTION. THE AVAILABLE SOLUTIONS FOR THESE MANEUVER(S) ARE, (IN ORDER OF PRIORITY) PGNS, AGS, CMC, AND CHARTS.</p> <p>A. THE FOLLOWING VOTING LOGIC WILL BE OBSERVED FOR ALL MANEUVERS:</p> <ol style="list-style-type: none"> <li>1. IF VHF AND RR AGREE - VOTE 2 OUT OF 3 SOURCES AND EXECUTE THE PRIORITY SOLUTION</li> <li>2. IF VHF AND RR DISAGREE - MSFN WILL BE UTILIZED TO ISOLATE THE FAILED SYSTEM</li> </ol> <p>B. AGREEMENT BETWEEN SOURCES IS DEFINED AS</p> <ol style="list-style-type: none"> <li>1. DIRECT RNDZ - TIP                             <ol style="list-style-type: none"> <li>(A) 3 FPS IN <math>\Delta V_X</math></li> <li>(B) 7 FPS IN <math>\Delta V_Y</math></li> <li>(C) 9 FPS IN <math>\Delta V_Z</math></li> </ol> </li> </ol> <p style="text-align: center;"><u>NOTE</u> LM BIASES OF 1 FPS IN <math>\Delta V_X</math> AND -2 FPS IN <math>\Delta V_Z</math> WILL BE APPLIED TO THE LM SOLUTION FOR COMPARISON WITH THE CSM SOLUTION</p> <ol style="list-style-type: none"> <li>2. COELLIPTIC SEQUENCE RNDZ - ALL MANEUVERS                             <ol style="list-style-type: none"> <li>(A) 3 FPS IN <math>\Delta V_X</math></li> <li>(B) 7 FPS IN <math>\Delta V_Y</math></li> <li>(C) 9 FPS IN <math>\Delta V_Z</math></li> </ol> </li> </ol> <p>C. THE CMC SOLUTION FOR THE PLANE CHANGE MANEUVER WILL ALWAYS BE EXECUTED IF GREATER THAN 5 FPS.</p>						
5-112		<p>LIFTOFF WILL BE COMPUTED TO SATISFY THE FOLLOWING CONSTRAINTS:</p> <p>A. DIRECT RNDZ</p> <ol style="list-style-type: none"> <li>1. THE <math>\Delta H</math> AT TPI WILL BE 15 NM.</li> <li>2. THE <math>\Delta \theta</math> AT TPI WILL BE +1.69 DEG.</li> <li>3. THE WEDGE ANGLE AT INSERTION WILL BE ZERO DEGREES.</li> <li>4. TPI WILL OCCUR 45 MIN AFTER INSERTION.</li> </ol> <p>B. COELLIPTIC SEQUENCE RNDZ</p> <ol style="list-style-type: none"> <li>1. THE <math>\Delta H</math> AT TPI WILL BE 15 NM.</li> <li>2. THE NOMINAL ELEVATION ANGLE (26.6 DEG) WILL OCCUR 16 MIN PRIOR TO SUNRISE.</li> <li>3. THE CDH MANEUVER WILL BE APPROXIMATELY ZERO <math>\Delta V</math>.</li> </ol>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RENDEZVOUS	5-18	
								Tape 11A.7



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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
		<u>TRANSEARTH ENTRY</u>						
5-121		TRANSEARTH MCC WILL BE TARGETED TO ACHIEVE ENTRY CONDITIONS AS FOLLOWS:						
		A. IF $V_{EI} > 31000$ FPS OR G&N NO-GO, USE STEEP TARGET LINE.						
		B. IF $V_{EI} < 31000$ FPS AND G&N GO, USE SHALLOW TARGET LINE.						
5-122		TRANSEARTH MCC PHILOSOPHY						
		A. TEC MCC WILL NOT USE LANDING POINT CONTROL UNLESS THE LANDING POINT IS UNACCEPTABLE.						
		B. IF GAMMA EI IS OUTSIDE THE ENTRY CORRIDOR.						
		1. PRIOR TO GET OF NOMINAL MCC 5 - EXECUTE MCC ASAP IF PREDICTED $\Delta V$ AT MCC 5 IS $> 20$ FPS						
		2. AFTER MCC 5 - EXECUTE MCC ASAP						
		C. MCC GREATER THAN MINIMUM IMPULSE CAPABILITY WILL USE THE SPS IF PRACTICAL.						
5-123		TEC MCC FOR LANDING AREA CONTROL						
		A. PRIOR TO EI MINUS 24 HRS - WILL BE EXECUTED FOR RECOVERY ACCESS VIOLATIONS, UNACCEPTABLE WEATHER AT IP, OR IF THERE IS ANY LAND MASS IN THE G&N EMS, OR CONSTANT G LANDING AREAS OR IF A SIGNIFICANT LAND MASS IS IN ANY OTHER PORTION OF THE OPERATIONAL FOOTPRINT.						
		B. AFTER EI MINUS 24 HRS - WILL NOT BE EXECUTED.						
5-124		RESERVED						
5-125		BACKUP ENTRY IS CONSTRAINED AS FOLLOWS:						
		A. THE CONSTANT G ENTRY MUST FALL BETWEEN 3 AND 5 G'S.						
		B. EMS RANGING WILL NOT BE ATTEMPTED UNTIL V IS LESS THAN 25500 FPS.						
5-126		WEATHER AVOIDANCE WITH AERODYNAMIC LIFT WILL NOT BE ATTEMPTED UNLESS THE G&N IS OPERATIONAL, OR EMS-INDICATED VELOCITY IS LESS THAN 25500 FPS.						
5-127		PREDICTED ENTRY CORRIDOR VIOLATION AFTER THE LAST MCC OPPORTUNITY						
		A. UNDERSHOOT LINE EXCEED - GROUND ADVISE CREW TO FLY FULL LIFT UNTIL PEAK G IS PASSED, THEN FLY G&N.						
		B. OVERSHOOT LINE EXCEED - GROUND ADVISE CREW TO FLY NEGATIVE LIFT TO 2 G'S FOLLOWED BY 4-G CONSTANT ENTRY.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	TRANSEARTH ENTRY	5-20	
								Tape 57.5

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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
	5-128	RESERVED						
	5-129	RESERVED						
	5-130	THE G&N IS NO-GO DURING ENTRY IF						
		A. P65 VALUE OF VL DIFFERS FROM THE GROUND COMPUTED LIMITS						
		B. P65 VALUE OF DL DIFFERS FROM THE GROUND COMPUTED LIMITS						
		C. CAUSES TRAJECTORY TO VIOLATE THE OFFSET LIMITS (SKIP) ON EMS SCROLL						
		D. CAUSES TRAJECTORY TO VIOLATE THE ONSET LIMITS (G) ON EMS SCROLL						
		E. THE G&N TRIM ATTITUDES AT CM/SM SEP DIFFER FROM THE HORIZON MONITOR ATTITUDE BY GREATER THAN 5 DEG						
		F. THE G&N TRIM ATTITUDES AT .05 G DIFFER FROM THE GROUND VALUES BY GREATER THAN 5 DEG						
		G. THE CMC FAILS TO SEQUENCE FROM P63 TO P64 AT RET .05 G ±5 SEC						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	TRANSEARTH EARTH	5-21	Tape 18.6

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
	5-131	<p>TEI ABORTS AND RESIDUAL TRIMMING PHILOSOPHY</p> <p>A. IN GENERAL, ONCE THE SPS HAS BEEN IGNITED, THE MANEUVER WILL BE COMPLETED WITH THE SPS ENGINE. THIS IMPLIES THAT THERE WILL BE NO MANUAL SHUTDOWNS AND AS MANY RESTARTS AS NECESSARY TO COMPLETE THE TEI MANEUVER. QUANTITIES FOR THE <math>\Delta V</math> RULES LISTED BELOW FOR PREMATURE SHUTDOWNS ARE GUIDELINES FOR USE OF RCS PROPELLANT.</p> <ol style="list-style-type: none"> <li>1. NO SPS IGNITION - DO NOT ATTEMPT A MANUAL RESTART. SLIP 1 REV AND DO MALFUNCTION PROCEDURES.</li> <li>2. AFTER SPS IGNITION, THERE WILL BE NO MANUAL SPS SHUTDOWN.</li> <li>3. FOR PREMATURE SHUTDOWN:                             <ol style="list-style-type: none"> <li>(A) TEI <math>\Delta V</math> REMAINING GREATER THAN THE RCS <math>\Delta V</math> CAPABILITY MINUS 20 FPS - RESTART SPS AND COMPLETE THE TARGETED BURN. NO TRIM.</li> <li>(B) TEI <math>\Delta V</math> REMAINING LESS THAN THE RCS <math>\Delta V</math> CAPABILITY MINUS 20 FPS, BUT GREATER THAN 5 FPS - RCS +X OR SPS MAY BE USED TO COMPLETE THE TARGETED BURN BASED UPON CREW JUDGEMENT. NO TRIM.</li> <li>(C) RESIDUAL LESS THAN 5 FPS - TRIM X AND Z.</li> </ol> </li> </ol> <p style="text-align: center;"><u>NOTE</u> THIS RULE ALSO APPLIES FOR A DPS TEI WITH NO OPERATIONAL SPS FOR BACKUP.</p> <p>B. PREMATURE DPS TEI SHUTDOWN WITH AN OPERATIONAL SPS AS BACKUP</p> <ol style="list-style-type: none"> <li>1. NO DPS IGNITION - SLIP 1 REV AND DO MALFUNCTION PROCEDURES AND RETARGET USING DPS OR SPS.</li> <li>2. FOR A PREMATURE SHUTDOWN IN THE MODE III REGION (ACHIEVED TEI <math>\Delta V &lt; 1700</math> FPS/PRE-ABORT PERIOD LESS THAN 15 HR) - TARGET THE SPS FOR THE NEXT TEI.</li> <li>3. FOR A PREMATURE SHUTDOWN IN THE MODE I REGION (ACHIEVED TEI <math>\Delta V &gt; 1700</math> FPS) - TARGET THE SPS AT TEI +2 HR.</li> </ol> <p>RULES 5-132 THROUGH 5-139 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	TRANSEARTH ENTRY	5-22	Tape 18.7

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 80%;"> <p style="text-align: center; margin: 0;">RANGE SAFETY RULES AND AGREEMENTS</p> <p style="text-align: center; margin: 0;">GENERAL</p> </div>						
	5-140	RANGE SAFETY POLICIES AND CRITERIA ARE SPECIFIED IN AFETR MANUAL (AFETRM) 127-1 DATED 1 JANUARY 1969. THE FOLLOWING MISSION RULES CONCERNING SPECIFIC AFETR/NASA INTERFACE SUPPLEMENT AFETRM 127-1.						
	5-141	THE RSO WILL ACCOMPLISH THE PAD EMERGENCY RANGE CUTOFF PROCEDURE IF THE SPACE VEHICLE WILL NOT LIFT OFF AFTER IGNITION AND NASA IS UNABLE TO ACCOMPLISH CUTOFF. THE RSO WILL SEND "ARM/MFCO" ONLY IN RESPONSE TO A CODED VERBAL REQUEST FROM THE NASA LAUNCH VEHICLE TEST CONDUCTOR (CLTC). THE CLTC WILL CALL THE RSO ON THE CLTC-RSO DIRECT LINE TO TRANSMIT THIS REQUEST. THE RSO WILL NOT EXECUTE THIS PROCEDURE IF HE HAS A LIFTOFF INDICATION.						
	5-142	THE FLIGHT DIRECTOR (FD) WILL INITIATE ABORT IN RESPONSE TO A CODED VERBAL REQUEST FROM THE RSO. THIS PROCEDURE WILL BE EXECUTED IF RANGE SAFETY FLIGHT TERMINATION CRITERIA HAVE BEEN VIOLATED AND RSO EFFORTS TO TERMINATE THRUST HAVE FAILED. THE REQUEST FROM RSO TO FD WILL BE TRANSMITTED ON THE FLIGHT DIRECTOR LOOP WITH THE FIDO-RSO PRIVATE LINE AS BACKUP.						
	5-143	THE RSO WILL SEND "ARM/MFCO" IN RESPONSE TO A CODED VERBAL REQUEST FROM THE FLIGHT DIRECTOR (FD) OR THE FLIGHT DYNAMICS OFFICER (FIDO). THIS PROCEDURE WILL BE EXECUTED IF ABORT LIMITS HAVE BEEN EXCEEDED AND ABORT ACTION HAS BEEN UNSUCCESSFUL. THE REQUEST FROM FD/FIDO TO THE RSO WILL BE TRANSMITTED ON THE RSO LOOP (CAPE 111) WITH THE FIDO-RSO PRIVATE LINE AS BACKUP.						
	5-144	THE FD WILL INFORM THE RSO WHEN THE S-IC NO. 3 OR NO. 4 ENGINE HAS SHUT DOWN BY STATING "RSO, NO. 3 OUT" OR "NO. 4 OUT" ON THE RSO LOOP (CAPE 111) AND/OR ACTIVATE THE ENGINE OUT LIGHT ON THE RSO CONSOLE. THE NO. 3 ENGINE OUT LIGHT CIRCUIT FOR FD TO RSO IS HIGHLY DESIRABLE.						
	5-145	IF RANGE SAFETY DESTRUCT LINES ARE VIOLATED, THE RSO WILL SEND "ARM/MFCO" AND NOTIFY THE FD/FIDO. NO SPS THRUSTING WILL BE INITIATED FOLLOWING SUCH RANGE SAFETY ACTION EXCEPT TO PROVIDE CREW SAFETY AS DETERMINED BY THE FD.						
	5-146	IF AN ESTABLISHED IMPACT PREDICTION (IP) POINT IS ON THE CAPE KENNEDY LAND AREA, "DESTRUCT/PD" WILL BE TRANSMITTED.						
	5-147	IF AN ATTEMPT TO TERMINATE THRUST BY "ARM/MFCO" IS UNSUCCESSFUL WHILE THE IP IS ON THE CAPE KENNEDY LAND AREA, "DESTRUCT/PD" WILL BE SENT.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RANGE SAFETY	5-23	Tape 19.1

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
	5-148	WHEN THE IP HAS MOVED OFF THE CAPE, FLIGHT TERMINATION ACTION WILL BE LIMITED TO "ARM/MFCO" OR CREW INITIATED ABORT. THE "DESTRUCT/PD" FUNCTION WILL BE SENT ONLY AFTER FD/FIDO CONFIRMATION OF SATISFACTORY SPACECRAFT SEPARATION, AND ONLY IF FUEL DISPERSION IS NECESSARY.						
	5-149	IF AN IP POINT IS ESTABLISHED AND "DESTRUCT/PD" IS DEEMED UNNECESSARY, THE RSO WILL NOTIFY FD/FIDO, "SAFE WILL BE SENT UPON FD/FIDO'S REQUEST, 'RSO SEND SAFE'".						
	5-150	FD/FIDO WILL DECLARE TO THE RSO WHEN THERE IS NO POSSIBILITY OF INSERTING THE SPACECRAFT INTO AN ORBIT, AND THE RSO WILL NOT ALLOW THE AFRICAN GATE TO BE OVERFLOWN.						
	5-151	AN ETR RANGE SAFETY OFFICER (BRSO) IS REQUIRED AT BERMUDA TO MONITOR PRESENT POSITION AND IMPACT PREDICTION CHARTS, TO OBSERVE TELEMETRY DISPLAYS, AND TO TRANSMIT THE RANGE SAFETY FUNCTIONS WHEN COMMANDED TO DO SO BY THE RSO. FOR FLIGHT AZIMUTHS LESS THAN 090 DEGREES, THE BRSO WILL ASSUME PRIMARY RANGE SAFETY RESPONSIBILITY IN THE EVENT OF LOSS OF COMMUNICATIONS BETWEEN THE BRSO AND THE RSO.						
	5-152	SAFING BY THE RSO WILL BE TRANSMITTED AFTER GATE PENETRATION AND FIRST S-IVB CUTOFF WHEN THE FD/FIDO REQUESTS, "RSO SEND SAFE." WHEN SAFING IS CONFIRMED, THE RSO WILL STATE "SAFING CONFIRMED." IN THE EVENT OF LOSS OF COMM WITH FD/FIDO, THE RSO WILL SEND SAFE ONLY IF HE CAN CONFIRM S-IVB CUTOFF.						
	5-153	IF SAFING CANNOT BE CONFIRMED BY THE RSO, ANOTHER SAFING ATTEMPT WILL BE MADE BY THE RSO ON THE FIRST ORBITAL PASS OVER THE CAPE. COORDINATION WILL BE EFFECTED WITH THE SUPERINTENDENT OF RANGE OPERATIONS (SRO) AND FIDO TO ENSURE COMMAND COVERAGE AND TELEMETRY DISPLAY AVAILABILITY. AT THE AGREED TIME, FIDO WILL STATE, "RSO SEND SAFE." UPON CONFIRMATION, THE RSO WILL STATE, "SAFING CONFIRMED".						
	5-154	THE FD/FIDO WILL INFORM THE RSO IMMEDIATELY UPON DETERMINATION OF A SPACECRAFT SEPARATION. THIS NOTIFICATION WILL BE TRANSMITTED ON THE RSO LOOP (CAPE 111) WITH THE FIDO-RSO PRIVATE LINE AS BACKUP.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RANGE SAFETY	5-24	Tape 19.2

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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM						
<u>TRACKING SOURCES</u>							
	5-155	AT LEAST TWO (2) VEHICLE POSITION DATA SOURCES ARE MANDATORY TO L/O FOR EACH PHASE OF POWERED FLIGHT PRIOR TO THE AFRICAN GATE TO ENABLE THE RANGE SAFETY OFFICER TO DETERMINE IF THE VEHICLE IS NORMAL OR VIOLATES ESTABLISHED INFLIGHT SAFETY CRITERIA.					
	5-156	DATA FROM TWO (2) OF THE FOLLOWING THREE (3) RADARS ARE MANDATORY TO L/O (OTHER HIGHLY DESIRABLE): BERMUDA FPS-16, BERMUDA FPQ-6, AND GRAND TURK TPQ-18.					
	5-157	PRESENT POSITION AND IP PLCTS AT BERMUDA (BDA) USING INPUTS FROM EITHER THE BDA FPS-16 OR BDA FPQ-6 RADAR ARE HIGHLY DESIRABLE FOR LAUNCH.					
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RANGE SAFETY	5-25	Tape 19.3

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM						
		<u>AIRBORNE SYSTEMS</u>					
	5-158	TWO (2) OPERATIONAL RANGE SAFETY COMMAND RECEIVERS ON EACH LAUNCH VEHICLE STAGE (S-IC, S-II, AND S-IVB) ARE MANDATORY TO L/O. THE RANGE SAFETY SUPERVISOR (CRSS) AT THE LAUNCH CONTROL CENTER WILL DETERMINE IF THE RECEIVERS ARE OPERATING PROPERLY.					
	5-159	IU C-BAND BEACON NO. 1 OR NO. 2 IS HIGHLY DESIRABLE FOR LAUNCH.					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RANGE SAFETY	5-26
							Tape 19.4

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
		<u>COMMAND/CONTROL</u>						
5-160	NASA BERMUDA DRS COMMAND/CONTROL CAPABILITY IS MANDATORY TO L/O FOR FLIGHT AZIMUTHS LESS THAN 90 DEGREES.							
5-161	A 4-SECOND TIME DELAY BETWEEN "ARM/MFCC" AND "DESTRUCT/PD" WILL BE PROVIDED BY TIMERS IN THE RSO CONSOLE IN THE RCC.							
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RANGE SAFETY	5-27	Tape 19.5

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## MISSION RULES

### SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
		<u>COMMUNICATIONS</u>						
	5-162	ONE (1) OF TWO (2) PRIVATE, INDEPENDENT, GEOGRAPHICALLY DIVERSIFIED COMMUNICATIONS LINKS BETWEEN THE RSO AND BRSO IS MANDATORY AND THE OTHER IS HIGHLY DESIRABLE.						
	5-163	ONE (1) OF THE FOLLOWING THREE (3) COMMUNICATIONS LINKS IS MANDATORY BETWEEN THE RSO AND FD/FIDO AND THE OTHERS ARE HIGHLY DESIRABLE.  A. RSO LOOP (CAPE 111) B. RSO PRIVATE LINE C. FLIGHT DIRECTOR LOOP						
	5-164	A COMMUNICATIONS LINK BETWEEN THE RSO AND THE RANGE SAFETY SUPERVISOR (CRSS) AT THE LAUNCH CONTROL CENTER IS MANDATORY FOR T-40 MINUTE DESTRUCT CHECKS.						
	5-165	A DIRECT LINE COMMUNICATIONS LINK BETWEEN THE RSO AND THE LAUNCH VEHICLE TEST CONDUCTOR (CLTC) IS HIGHLY DESIRABLE.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RANGE SAFETY	5-28	Tape 19.6

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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONTINUED

R	ITEM							
		<u>TELEMETRY</u>						
	5-166	IU TELEMETRY DATA (ONBOARD GUIDANCE PARAMETERS) TO THE RTCS ARE HIGHLY DESIRABLE UNTIL S-IVB CUTOFF FOR IP COMPUTATION AND RSO DISPLAY.						
	5-167	TELEMETRY REQUIREMENTS TO BE DISPLAYED FOR THE RSO AND THE BRSSO ARE HIGHLY DESIRABLE.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RANGE SAFETY	5-29	Tape 19.7

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MISSION RULES

SECTION 5 - TRAJECTORY AND GUIDANCE - CONCLUDED

R	ITEM						
		<u>RANGE SAFETY WEATHER RESTRICTIONS</u>					
5-168	WIND RESTRICTIONS	AN ANNUAL PROFILE WIND RESTRICTION OF 1.25 SIGMA (11 PERCENT) WILL BE IN EFFECT FOR LAUNCH.					
5-169	CEILING AND VISIBILITY RESTRICTIONS	NO CEILING OR VISIBILITY RESTRICTIONS WILL BE IMPOSED PROVIDING CNV FPS-16 AND MILA TPQ-18 RADARS AND BEACON NO. 1 ARE OPERATIONAL.					
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	TRAJECTORY AND GUIDANCE	RANGE SAFETY	5-30	Tape 19.8

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## MISSION RULES

### SECTION 6 - SLV - TB1 THROUGH TB4/TB4A

R	ITEM	SUMMARY OF LAUNCH PHASE RULES					
		<p>6-1 S-IC LOSS OF THRUST</p> <p>6-2 LOSS OF ATTITUDE CONTROL</p> <p>6-3 INERTIAL PLATFORM FAILURE - ACCELEROMETER</p> <p>6-4 SLV INERTIAL PLATFORM FAILURE</p> <p>6-5 S-IVB CRYO REPRESS VALVES FAIL OPEN</p> <p>6-6 EXCESSIVE ATTITUDE ERROR IN PITCH OR YAW DURING S-II BURN</p> <p>6-7 S-II LOSS OF THRUST</p> <p>6-8 S-II GIMBAL SYSTEM FAILURE</p> <p>6-9 S-II SECOND PLANE SEPARATION FAILS</p> <p>6-10 S-IVB LOSS OF HYDRAULIC FLUID</p> <p>6-11 S-IVB LOSS OF THRUST</p> <p>6-12 S-IVB COLD HELIUM SHUTOFF VALVE(S) FAIL OPEN</p> <p>THE FOLLOWING MISSION RULES ALSO APPLY TO THIS SECTION: NONE</p>					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-1
							Tape 53.4

# NASA - Manned Spacecraft Center

## MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONTINUED

R	ITEM							
		<p>A. BSE GENERALIZED SWITCH SELECTOR COMMAND CAPABILITY EXISTS:</p> <ol style="list-style-type: none"> <li>1. WHEN CREW ENABLES IU COMMAND SYSTEM (EXCEPT AS NOTED BELOW IN ITEM D)</li> <li>2. AFTER TB7 + 20 MIN</li> <li>3. AFTER SPACECRAFT SEPARATION</li> </ol> <p>B. BSE MANEUVER UPDATE AND INHIBIT CAPABILITY EXISTS FOR TB7 MANEUVERS ONLY.</p> <p>C. BSE HAS NAVIGATION UPDATE CAPABILITY (FMR 6-3) AND TARGET UPDATE CAPABILITY (NO REQUIREMENT).</p> <p>D. BSE HAS NO COMMAND CAPABILITY DURING POWERED BURN PHASES.</p> <p>E. A SAFE DISTANCE BETWEEN THE SPACECRAFT AND S-IVB/IU IS DEFINED AS 7000 FT.</p> <p>F. BSE WILL RECOMMEND NO S-IVB RESTART FOR ANY CONFIRMED CONDITION/MALFUNCTION IN THE LAUNCH VEHICLE WHICH RESULTS IN:</p> <ol style="list-style-type: none"> <li>1. A CATASTROPHIC HAZARD</li> <li>2. ACHIEVEMENT OF AN S-IVB ENGINE MAINSTAGE BURN WITH EXPECTED CUTOFF OR SHUTDOWN CONDITIONS DEFINITELY PRECLUDING AN ACCEPTABLE LUNAR MISSION. IN APPLYING THIS CRITERIA TO SPECIFIC MISSION RULES, A GO/NO GO RECOMMENDATION WILL BE REQUIRED IF INSUFFICIENT S-IVB CONSUMABLES OR PROPULSION PERFORMANCE IS AVAILABLE TO ASSURE ANY FINITE PROBABILITY OF ACHIEVING A CUTOFF ORBIT WITH 28K NM APOGEE ALTITUDE (FMR 7-1).</li> </ol> <p>G. IN THE EVENT OF NO S-IVB IGNITION AT RESTART OR AN EARLY S-IVB SECOND BURN CUTOFF, THE SPACECRAFT SHOULD REMAIN ATTACHED TO THE S-IVB/IU AND MONITOR LH<sub>2</sub> AND LOX ULLAGE PRESSURES UNTIL THE STAGE STATUS CAN BE ASSESSED BY GROUND. IF EMERGENCY SEPARATION IS REQUIRED IMMEDIATELY AFTER S-IVB CUTOFF, THE SPACECRAFT SHOULD IMMEDIATELY GO TO A SAFE DISTANCE (7000 FT) FROM THE S-IVB/IU.</p> <p>H. ABORT OR SPACECRAFT SEPARATION DURING LAUNCH PHASE WILL BE RECOMMENDED FOR THE FOLLOWING:</p> <ol style="list-style-type: none"> <li>6-1 S-IC LOSS OF THRUST</li> <li>6-5 S-IVB LOX CRYO REPRESS VALVE(S) FAIL OPEN</li> <li>6-6 EXCESSIVE ATTITUDE ERRORS IN PITCH OR YAW DURING S-II BURN</li> <li>**6-7 S-II LOSS OF THRUST</li> <li>**6-8 S-II ANY SINGLE ACTUATOR HARDOVER INBOARD</li> <li>6-9 S-II SECOND PLANE SEPARATION FAILS TO OCCUR AT TB3 + 31 SEC</li> <li>6-10 S-IVB LOSS OF ENGINE HYDRAULIC FLUID PRIOR TO FIRST S-IVB BURN</li> <li>6-11 S-IVB STAGE LOSS OF THRUST</li> <li>6-12 S-IVB COLD HELIUM SHUTOFF VALVE(S) FAILS OPEN</li> </ol> <p>I. SPACECRAFT GUIDANCE TAKEOVER WILL BE RECOMMENDED FOR THE FOLLOWING:</p> <ol style="list-style-type: none"> <li>6-4 LAUNCH VEHICLE INERTIAL PLATFORM FAILURE-ATTITUDE REFERENCE</li> <li>7-8 LOSS OF ATTITUDE CONTROL DURING TB5, TB7</li> </ol> <p>J. S-II/S-IVB EARLY STAGING WILL BE RECOMMENDED FOR THE FOLLOWING:</p> <ol style="list-style-type: none"> <li>6-5 S-IVB LOX CRYO REPRESS VALVE(S) FAIL OPEN</li> <li>**6-6 EXCESSIVE ATTITUDE ERROR IN PITCH OR YAW DURING S-II BURN</li> <li>**6-7 S-II LOSS OF THRUST</li> <li>**6-8 S-II ANY SINGLE ACTUATOR HARDOVER INBOARD</li> <li>**6-12 S-IVB COLD HELIUM SHUTOFF VALV(S) FAILS OPEN</li> </ol> <p style="text-align: center;">** TIME DEPENDENT</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-2	Tape 11A.8

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## MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONTINUED

R	ITEM							
		<p>K. TLI INHIBIT PRIOR TO RESTART OR SPACECRAFT SEPARATION WILL BE RECOMMENDED FOR THE FOLLOWING:</p> <ul style="list-style-type: none"> <li>7-1 INSUFFICIENT PROPELLANTS REMAIN FOR ACHIEVEMENT OF ACCEPTABLE ALTERNATE MISSIONS.</li> <li>7-5 FAILURE OF RANGE SAFETY SYSTEM AFTER INSERTION</li> <li>7-8 LOSS OF ATTITUDE CONTROL</li> <li>7-22 S-IVB CONFIRMED LOSS OF HYDRAULIC FLUID</li> <li>8-6 S-IVB ACTUATOR CONFIRMED HARDOVER PRIOR TO IGNITION</li> <li>8-8 LOSS OF ATTITUDE CONTROL DURING S-IVB SECOND BURN</li> </ul> <p>L. SPACECRAFT SEPARATION OR TLI INHIBIT WILL BE RECOMMENDED UNLESS COMMAND ACTION IS SUCCESSFUL FOR THE FOLLOWING:</p> <ul style="list-style-type: none"> <li>7-4 J-2 ENGINE MAIN OXIDIZER VALVE FAILS TO CLOSE AT FIRST S-IVB CUTOFF</li> <li>*7-6 S-IVB COLD HELIUM SHUTOFF VALVES FAIL TO CLOSE</li> <li>7-12 J-2 ENGINE MAIN FUEL VALVE OR MAIN OXIDIZER VALVE LEAKAGE</li> <li>*7-14 S-IVB STAGE COMMON BULKHEAD DELTA PRESSURE REACHES OR EXCEEDS +36 OR -26 PSID</li> <li>7-20 J-2 ENGINE START BOTTLE PRESSURE OUTSIDE RESTART LIMITS</li> </ul> <p style="padding-left: 40px;">*EMERGENCY SEPARATION REQUIRED</p> <p>M. BSE WILL INHIBIT TB6 IN THE EVENT A TLI NO-GO DECISION IS MADE IN TB5.</p> <p>N. THERE MUST BE AT LEAST AN 80 MIN COAST PERIOD BETWEEN S-IVB FIRST AND SECOND BURNS.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-3	Tape 20.3

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MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
6-1		<p>S-IC STAGE LOSS OF THRUST</p> <p>A. ANY SINGLE ENGINE PRIOR TO TB3</p> <p>B. ANY TWO OR MORE ENGINES PRIOR TO DEACTIVATION OF ENGINE AUTO ABORT</p> <p>C. LOSS OF TWO ADJACENT CONTROL ENGINES AFTER DEACTIVATION OF AUTO ABORT AND BEFORE TB2 + 8 SEC</p> <p>D. LOSS OF TWO ADJACENT CONTROL ENGINES AFTER TB2 + 8 SEC</p> <p>E. LOSS OF THRUST - ENGINE 3 OR 4 (THIS RULE APPLIES ONLY FOR THE UNIQUE CASE OF ENGINE 3 OR 4 THRUST LOSS BETWEEN 0 TO 45 SEC)</p> <p>1. VOICE COMM WITH RSO</p> <p>2. NO VOICE COMM WITH RSO</p>	<p>LAUNCH</p> <p>LAUNCH</p>	<p>A. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND FIDO.</p> <p>B. <u>ABORT</u></p> <p>BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST.</p> <p>C. <u>ABORT</u></p> <p>BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST WHEN ALL ENGINES CUT OFF</p> <p>D. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND FIDO.</p> <p>E. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND FIDO. FLIGHT INFORM RSO.</p> <p>1.(A) FLIGHT CONFIRM ENGINE 3 OR 4 OUT VIA RSO LOOP.</p> <p>(B) FLIGHT CONFIRM NO OTHER KNOWN ANOMALIES BY LIGHT ACTIVATION AND VOICE REPORT.</p> <p>2. FLIGHT CONFIRM ENGINE 3 OR 4 OUT AND NO OTHER KNOWN ANOMALIES BY LIGHT ACTIVATION.</p>	<p><u>CUES</u></p> <p>A&amp;B. 1. THRUST OK SWITCHES - OFF (K33-115 THROUGH K47-115)</p> <p>2. THRUST CHAMBER PRESSURE (D8-101 THROUGH D8-105)</p> <p>3. LONGITUDINAL ACCELERATION (A2-603)</p> <p>4. FINAL THRUST OK CUTOFF - ON (K52-115 THROUGH K56-115)</p> <p><u>NOTES</u></p> <p>A&amp;B. 1. CREW MAY DEACTIVATE AUTOMATIC ABORT AFTER TB1 120 SEC.</p> <p>C. 1. FOR LOSS OF TWO ADJACENT CONTROL ENGINES BEFORE CECO (TB2 + 0 ), ALL ENGINES WILL CUT OFF AT CECO, FOR LOSS OF TWO ADJACENT CONTROL ENGINES AFTER CECO. ALL ENGINES WILL CUT OFF IMMEDIATELY.</p> <p>D. 1. ALL ENGINES WILL SHUT DOWN IMMEDIATELY. S-IC/S-II STAGING IS ENABLED AT TB2 + 16.9 SEC.</p> <p><u>CUES</u></p> <p>E. 1. THRUST CHAMBER PRESSURE (D8-103 AND D8-104)</p> <p>2. ENGINE 3 OR ENGINE 4 THRUST OK SWITCHES OFF (K39-115 THROUGH K44-115)</p> <p>3. ENGINE 3 OR 4 FNL THRUST OK CUTOFF (K54-115 THROUGH K55-115)</p> <p><u>NOTES</u></p> <p>E. 1. RSO PL OR FD LOOP BACKUP TO RSO LOOP.</p> <p>2. CONFIRMATION OF NO OTHER KNOWN ANOMALIES WILL BE BASED ON:</p> <p>(A) ENGINE CHAMBER PRESSURE NOT DECREASING, AND</p> <p>(B) THRUST OK SWITCHES - ON</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-4	Tape 54.7

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MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	6-2	LOSS OF ATTITUDE CONTROL A. PRIOR TO DEACTIVATION OF EDS AUTO ABORT  B. BETWEEN DEACTIVATION OF EDS AUTO ABORT AND TB5 INITIATE	LAUNCH  LAUNCH	A. <u>ABORT</u> BSE TRANSMIT ABORT REQUEST  B. <u>ABORT</u> BSE TRANSMIT ABORT REQUEST	<p><u>CUES</u></p> <p>A.1. ANGULAR RATES - PITCH (R4-602) OR YAW (R5-602) GREATER THAN 2 DEG/SEC AND NOT DECREASING. ROLL (R6-602) GREATER THAN 5 DEG/SEC AND NOT DECREASING.</p> <p>2. ANGULAR RATES - PITCH (R13-602) OR YAW (R8-602) GREATER THAN 2 DEG/SEC AND NOT DECREASING. ROLL (R12-602) GREATER THAN 5 DEG/SEC AND NOT DECREASING (SEE NOTE A.2)</p> <p>3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE A.2.)</p> <p><u>NOTES</u></p> <p>A.1. THESE CUES ARE VALID IF RATE CHANNEL SWITCHOVER HAS NOT OCCURRED.</p> <p><u>CUES</u></p> <p>B.1. ANGULAR RATES - PITCH (R4-602), YAW (R5-602), GREATER THAN OR EQUAL TO 10 DEG/SEC, ROLL (R34-602) GREATER THAN OR EQUAL TO 20 DEG/SEC.</p> <p>2. ANGULAR RATES - PITCH (R13-602), YAW (R8-602), GREATER THAN OR EQUAL TO 10 DEG/SEC.</p> <p>3. EDS OVERRATE - PITCH OR YAW (K84-602), ROLL (K83-602).</p> <p><u>NOTES</u></p> <p>B.1. R13-602 AND R8-602 ARE VALID IF RATE CHANNEL SWITCHOVER HAS NOT OCCURRED.</p> <p>2. LOSS OF ATTITUDE CONTROL ALERT WILL BE GIVEN FOR THE FOLLOWING CONDITIONS:</p> <p>(A) LVDC/LVDA COMPUTATIONAL FAILURE.</p> <p>(B) ATTITUDE ERROR SIGNALS: TB1 + 120 SEC THRU S-II BURN - PITCH, YAW, ROLL, 5 DEG. S-IVB BURN - PITCH AND YAW, 5 DEG; ROLL, 3.5 DEG.</p> <p>(C) FAILURE TO INITIATE PROPER GUIDANCE SEQUENCE</p> <p>(D) S-IVB ENGINE ACTUATOR HARDOVER GREATER THAN ±5 DEG (S-II BURN ONLY)</p> <p>(E) FAILURE OF S-IVB ENGINE HYDRAULICS (S-IVB BURN ONLY)</p> <p>3. ROLL ATTITUDE ERRORS &gt;3.5 DEG. DURING S-IVB BURN MAY BE A RESULT OF LOSS OF BOTH APS MODULES. THE CREW SHOULD ATTEMPT TO CONTROL ROLL WITH RCS.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-5	Tape 54.5

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## MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	6-3	INERTIAL PLATFORM FAILURE - ACCELEROMETER (ONE OR MORE AXIS)	LAUNCH COAST RESTART	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT, FIDO, AND GUIDO</p> <p>CAPCOM ADVISE CREW</p>	<p><u>CUES</u></p> <ol style="list-style-type: none"> <li>GUIDANCE STATUS WORD (MODE CODE 24) (H60-603)</li> <li>BITS D26 AND D25 FOR Z ACCEL SET TO "ONE"</li> <li>BITS D24 AND D23 FOR X ACCEL SET TO "ONE"</li> <li>BITS D22 AND D21 FOR Y ACCEL SET TO "ONE"</li> <li>ACCELEROMETER PICKOFFS (X, Y, OR Z) INDICATE IN EXCESS OF 3 DEG AND NOT DECREASING (H10-603, H11-603, H12-603)</li> </ol> <p><u>NOTES</u></p> <ol style="list-style-type: none"> <li>NO EFFECT ON VEHICLE TRAJECTORY DURING S-IC STAGE BURN.</li> <li>LVDC SWITCHES TO A BACKUP MODE AND UTILIZES A PRECOMPUTED F/M PROFILE FOR FAILED AXIS DURING THE S-IC, S-II, AND S-IVB BURNS. THE IU STATE VECTOR THEREAFTER MAY NOT REFLECT THE ACTUAL FLIGHT TRAJECTORY.</li> <li>A NAVIGATION UPDATE WILL BE REQUIRED UNLESS REAL-TIME ANALYSIS INDICATES A NAVIGATION UPDATE IS NOT REQUIRED (SEE FMR 5-29).</li> <li>CREW WILL INITIATE MANUAL CUTOFF FOR AN OVERSPEED CONDITION.</li> <li>THE SECOND BURN PRECOMPUTED F/M PROFILE FOR THE FAILED AXIS ASSUMES NOMINAL PROPULSION PERFORMANCE AND NOMINAL MASS HISTORY.</li> </ol>			
	6-4	LAUNCH VEHICLE INERTIAL PLATFORM FAILURE - ATTITUDE REFERENCE	ALL	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND RECOMMEND SPACECRAFT GUIDANCE TAKEOVER</p>	<p><u>CUES</u></p> <ol style="list-style-type: none"> <li>GUIDANCE REFERENCE FAILURE (D04 OR D06) GUID MODE WORD 2 (MODE WORD 26) BIT 8 SET TO ONE (H60-603)</li> <li>GUIDANCE STATUS WORD (MODE CODE 24) (H60-603)</li> <li>BITS D20 AND D19 FOR Z GIMBAL SET TO "ONE"</li> <li>BITS D18 AND D17 FOR X GIMBAL SET TO "ONE"</li> <li>BITS D16 AND D15 FOR Y GIMBAL SET TO "ONE"</li> <li>LADDER OUTPUTS CONSTANT FOR FAILED AXES (H54-603, H55-603, H56-603)</li> <li>ATTITUDE ERROR CONSTANT FOR FAILED AXES (H69-602, H70-602, H71-602)</li> </ol> <p><u>NOTES</u></p> <p>IN THE EVENT OF THIS FAILURE PRIOR TO TB6, THE CREW WILL HAVE TO INITIATE TB6, AND TLI C/O WILL BE ISSUED BY CMC.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-6	Tape 11B.1

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MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
6-5		<p>S-IVB LOX CRYO REPRESS VALVE(S) FAILS OPEN</p> <p>A. PRIOR TO S-II CUTOFF</p> <p>1. DURING S-IC BURN</p> <p>2. DURING S-II BURN</p> <p>B. IN TB5</p>	<p>LAUNCH</p>     <p>EARTH ORBIT</p>	<p>A. CONTINUE MISSION/EARLY STAGE/ABORT</p> <p>1. <u>CONTINUE MISSION/EARLY STAGE/ABORT</u></p> <p>BSE INFORM FLIGHT AND RECOMMEND CREW HOLD TOWER. AT TB3 + 35 SECONDS, BSE RECOMMEND EARLY STAGE.</p> <p>IF S-IVB DOES NOT START, BSE TRANSMIT ABORT REQUEST</p> <p>IF S-IVB STARTS, BSE RECOMMEND CREW JETTISON TOWER AND CONTINUE MISSION.</p> <p>2. <u>CONTINUE MISSION/EARLY STAGE</u></p> <p>BSE INFORM FLIGHT AND RECOMMEND EARLY STAGE 3 MINUTES FROM MALFUNCTION.</p> <p>IF THE LOX TANK ULLAGE PRESSURE IS AT 50 PSIA OR OFF-SCALE HIGH, BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST.</p> <p>B. <u>CONTINUE MISSION/EMERGENCY SPACECRAFT SEPARATION</u></p> <p>BSE INFORM FLIGHT AND</p> <p>1. CYCLE AND CLOSE LOX CRYO REPRESS VALVE</p> <p>IF 1 IS UNSUCCESSFUL,</p> <p>2. VENT LOX TANK</p> <p>3. OPEN LH2 CRYO REPRESS VLV</p> <p>4. TERMINATE LOX VENT ASAP AFTER 8 MIN</p> <p>5. CLOSE LH2 CRYO REPRESS VALVE ASAP AFTER 40 MIN</p> <p>IF THE LOX TANK ULLAGE PRESSURE IS AT 50 PSIA OR OFF-SCALE HIGH, BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST AND REQUEST EMERGENCY SEPARATION.</p>	<p><u>CUES</u></p> <p>A.1. LOX TANK ULLAGE PRESSURE AT RELIEF (41-44 PSIA) AND RELIEVING (D179-406, D180-406)</p> <p>2. COLD HELIUM REGULATOR DISCHARGE PRESSURE REMAINS LESS THAN 50 PSIA (D105-403).</p> <p>3. COLD HELIUM BOTTLE PRESSURE DECAIVING (D261-403, D263-403).</p> <p>4. BURNER LOX REPRESS COIL TEMPERATURE BELOW -100° F (C378-403).</p> <p>B.1. COLD HELIUM REGULATOR DISCHARGE PRESSURE REMAINS LESS THAN 50 PSIA (D105-403).</p> <p>2. LOX TANK ULLAGE PRESSURE INCREASING (D179-406, D180-406).</p> <p>3. BURNER LOX REPRESS COIL TEMPERATURE BELOW -100° F (C378-403).</p> <p>4. COLD HELIUM BOTTLE PRESSURE DECAIVING (D261-403, D263-403).</p> <p><u>NOTES</u></p> <p>1. ACTION REQUIRED TO AVOID EXCEEDING LOX TANK OVER-PRESSURE OR BULKHEAD POSITIVE DELTA PRESSURE LIMITS (FMR 7-14).</p> <p>2. SEE FMR 7-18 FOR RESTART CRITERIA FOR OFF-NOMINAL COLD HELIUM PRESSURE.</p> <p>3. IF THE LOX NPV VALVE FAILS TO OPEN, THE LOX VENT VALVE CAN BE OPENED AS BACKUP.</p> <p>4. IF THE LH2 CRYO REPRESS VALVE IS OPENED, THE IU STATE VECTOR WILL BE IN ERROR SINCE THE IU USES A STORED PROGRAM. A NAV UPDATE MAY BE REQUIRED.</p> <p>5. THIS FAILURE WILL REQUIRE EVALUATION OF RESIDUALS TO DETERMINE ADEQUACY FOR TLI VELOCITY CUTOFF AND LUNAR IMPACT OPERATIONS.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-7	Tape 54.6

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MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
6-6		<p>EXCESSIVE ATTITUDE ERROR IN PITCH OR YAW DURING S-II BURN</p> <p>A. PRIOR TO S-IVB TO COI CAPABILITY</p> <p>B. BETWEEN S-IVB TO COI AND S-II CUTOFF</p>	LAUNCH	<p>ABORT/EARLY STAGE</p> <p>A. <u>ABORT</u></p> <p>BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST</p> <p>B. <u>EARLY STAGE</u></p> <p>BSE INFORM FLIGHT AND FIDO AND RECOMMEND EARLY STAGING</p>	<p><u>CUES</u></p> <p>1. GUIDANCE CHI MINUS THETA GIMBAL ANGLE (H60-603) GREATER THAN 85 DEG PITCH, 45 DEG YAW AND DIVERGING.</p> <p>2. ACTUATORS NOT RESPONDING (G8-201 THRU 204, G9-201 THRU 204, G30-201 THRU 204, G31-201 THRU 204).</p> <p>3. VERIFIED TRAJECTORY DEVIATION.</p> <p><u>NOTE</u></p> <p>THIS RULE DOES NOT APPLY FOR OTHER IDENTIFIED LAUNCH VEHICLE MALFUNCTIONS. SEE FMR 6-2, 6-3, 6-4, 6-7.</p>			
6-7		<p>S-II LOSS OF THRUST</p> <p>A. ANY SINGLE ENGINE FAILURE TO ATTAIN THRUST OR LOSS OF THRUST PRIOR TO NOMINAL S-II CUTOFF</p> <p>B. ANY TWO ENGINES FAILURE TO ATTAIN THRUST OR LOSS OF THRUST</p> <p>C. THREE OR MORE ENGINES OUT</p> <p>1. PRIOR TO S-IVB TO COI CAPABILITY</p> <p>2. AFTER S-IVB TO COI CAPABILITY BUT PRIOR TO LOW LEVEL SENSE ARM</p> <p>3. AFTER LOW LEVEL SENSE ARM</p> <p>(A) 3 CONTROL ENGINES OUT</p> <p>(B) ALL ENGINES OUT</p>	LAUNCH	<p>A. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND FIDO.</p> <p>B. <u>CONTINUE MISSION</u></p> <p>CREW WILL ABORT ON ONBOARD LIMITS.</p> <p>C. <u>ABORT/EARLY STAGE/CONTINUE MISSION</u></p> <p>1. <u>ABORT</u></p> <p>BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST.</p> <p>2. <u>EARLY STAGE</u></p> <p>BSE INFORM FLIGHT AND RECOMMEND EARLY STAGING</p> <p>3. <u>EARLY STAGE/CONTINUE MISSION</u></p> <p>(A) <u>EARLY STAGE</u></p> <p>BSE INFORM FLIGHT AND RECOMMEND EARLY STAGE</p> <p>(B) <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT</p>	<p><u>CUES</u></p> <p>A.1. THRUST OK SWITCHES-OFF (K231-201 THRU 205, K232-201 THRU 205).</p> <p>2. THRUST CHAMBER PRESSURE- ZERO (D13-201 THRU 205).</p> <p>3. LONGITUDINAL ACCELERATION (A2-603).</p> <p>B.1. THRUST OK SWITCHES OFF (K231-201 THRU 205, K232-201 THRU 205)</p> <p>2. THRUST CHAMBER PRESSURE ZERO (D13-201 THRU 205)</p> <p>3. LONGITUDINAL ACCELERATION (A2-603)</p> <p>C.1. THRUST OK SWITCHES OFF (K231-201 THRU 205, K232-201 THRU 205)</p> <p>2. THRUST CHAMBER PRESSURE ZERO (D13-201 THRU 205)</p> <p>3. LONGITUDINAL ACCELERATION (A2-603)</p> <p><u>C. NOTE</u></p> <p>AFTER PROGRAMED S-II CENTER ENGINE CUTOFF, ENGINES OUT REFERS ONLY TO CONTROL ENGINES.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-8	Tape 21.1

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MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
6-8	S-II STAGE ANY SINGLE ACTUATOR HARDOVER INBOARD  A. PRIOR TO S-IVB TO COI CAPABILITY  B. BETWEEN S-IVB TO COI CAPABILITY AND 30 SEC PRIOR TO S-II CUTOFF  C. AFTER S-II CUTOFF MINUS 30 SEC	LAUNCH	ABORT/EARLY STAGE/CONTINUE MISSION  <u>A. ABORT</u>  BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST  <u>B. EARLY STAGE</u>  BSE INFORM FLIGHT AND RECOMMEND EARLY STAGING  <u>C. CONTINUE MISSION</u>  BSE INFORM FLIGHT	<u>CUES</u>  1. YAW ACTUATOR POSITION EXCEEDS +6 DEG (G8-201 THRU 204, G30-201 THRU 204)  2. PITCH ACTUATOR POSITION EXCEEDS +6 DEG (G9-201 THRU 204, G31-201 THRU 204)  3. ADJACENT CONTROL ENGINE ACTUATOR IN SAME PLANE MOVES 4-1/2 DEG INBOARD (SAME MEASUREMENTS AS CUES 1 AND 2)  <u>NOTES</u>  THE CREW SHOULD ABORT OR EARLY STAGE AS SOON AS POSSIBLE AFTER MALFUNCTION OCCURS TO PRECLUDE EXCESSIVE THERMAL PROBLEM IN AFT INTERSTAGE.				
6-9	S-II SECOND PLANE SEPARATION FAILS TO OCCUR AT TB3 + 31.7 SEC	LAUNCH	<u>ABORT</u>  BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST. CREW ABORT PRIOR TO TB3 + 1 MIN 45 SEC.	<u>CUES</u>  1. SECOND PLANE SEPARATION INDICATION SHOWS NO SEPARATION (M86-206, M87-206)  2. GUIDANCE MODE WORD 1 MODE CODE 25 BIT D15 REMAINS ZERO (H60-603).  3. IGNITION BUS VOLTAGE REMAINS AT APPROXIMATELY 28 VOLTS (M125-207).  4. RECIRCULATION BUS VOLTAGE REMAINS AT APPROXIMATELY 56 VOLTS (M111-207).  <u>NOTES</u>  THE CREW SHOULD ABORT AS SOON AS POSSIBLE AFTER MALFUNCTION OCCURS TO PRECLUDE EXCESSIVE THERMAL PROBLEMS IN AFT INTERSTAGE.				
6-10	S-IVB LOSS OF HYDRAULIC FLUID PRIOR TO FIRST S-IVB BURN	LAUNCH	<u>ABORT</u>  BSE INFORM FLIGHT AND FIDO AND RECOMMEND NO S-IVB START. BSE TRANSMIT ABORT REQUEST AT S-II CUTOFF.	<u>CUES</u>  1. HYDRAULIC RESERVOIR OIL LEVEL APPROX ZERO PERCENT (L7-403).  2. HYDRAULIC SYSTEM PRESSURE LESS THAN 1700 PSIA (D41-403).  3. HYDRAULIC RESERVOIR PRESSURE APPROX ZERO PSIA (D42-403).  <u>NOTES</u>  1. IF L7-403 IS FUNCTIONING PROPERLY, IT IS REQUIRED FOR IMPLEMENTATION OF THIS RULE.  2. SPACECRAFT SHOULD HAVE COI CAPABILITY AT S-II CUTOFF  3. AT S-II CUTOFF, THE CREW SHOULD INHIBIT THE S-IVB START WITH THE TRANSLATION HANDCONTROLLER.				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB4A		6-9	Tape 54.8

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MISSION RULES

SECTION 6 - SLV - TB1 THROUGH TB4/TB4A - CONCLUDED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
6-11	S-IVB STAGE LOSS OF THRUST  A. FAILS TO ATTAIN THRUST OR PREMATURE SHUTDOWN PRIOR TO OBTAINING PARKING ORBIT  B. SHUTDOWN PRIOR TO ACHIEVING MINIMUM REQUIRED APOGEE ALTITUDE AND ENTRY INTO TB7 FOR REASONS OTHER THAN A PROPELLANT DEPLETION	LAUNCH  TLI	A. <u>ABORT</u>  BSE TRANSMIT ABORT REQUEST.  B. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND COMMAND TO EARTH ORBITAL CONFIGURATION  THE SPACECRAFT SHOULD REMAIN ATTACHED TO THE S-IVB/IU AND MONITOR LH2 AND LOX TANK ULLAGE PRESSURES. IF SEPARATION IS REQUIRED, THE SPACECRAFT SHOULD IMMEDIATELY GO TO A SAFE DISTANCE (7000 FT) FROM THE S-IVB/IU.	<u>CUES</u>  1. THRUST CHAMBER PRESSURE - ZERO (D1-401). 2. THRUST OK SWITCHES - OFF (K14-401, K157-401). 3. LONGITUDINAL ACCELERATION - ZERO (A2-603). 4. TB5 IS INITIATED. GUID MODE WORD 1 (MODE CODE 25); BIT D2 SET TO ONE (H60-603). 5. TB7 IS INITIATED. GUID MODE WORD 2 (MODE CODE 26); BIT D20 SET TO ONE (H60-603).  <u>NOTES</u> 1. SEPARATION WILL BE REQUIRED FOR VIOLATION OF FMR 7-6 OR FMR 7-14. 2. FOR A FAILURE OF THE S-IVB TO RESTART, THE ONBOARD PROGRAM WILL RECYCLE TO TB5 THROUGH TB6C FOR A SECOND RESTART OPPORTUNITY.				
6-12	S-IVB COLD HELIUM SHUTOFF VALVES FAIL OPEN  A. PRIOR TO S-II ENGINE START.  B. BETWEEN S-II ENGINE START AND 30 SEC PRIOR TO S-II CUTOFF  C. AFTER S-II CUTOFF MINUS 30 SEC	LAUNCH	A. <u>ABORT</u>  BSE INFORM FLIGHT AND TRANSMIT ABORT REQUEST  B. <u>EARLY STAGE</u>  BSE INFORM FLIGHT AND RECOMMEND EARLY STAGING IMMEDIATELY. IF PRIOR TO TOWER JETTISON, THE CREW SHOULD HOLD THE TOWER UNTIL AFTER S-IVB START  C. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT	<u>CUES</u>  1. COLD HELIUM REG DISCHARGE PRESSURE REMAINS GREATER THAN 200 PSIA (D105-403) 2. LOX ULLAGE PRESSURE AT RELIEF SETTING (41-44 PSIA) AND RELIEVING (D179-406, D180-406) 3. COLD HELIUM BOTTLE PRESSURE DECAYING (D261-403, D263-403).				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB1 THRU TB4/TB-A		6-10	Tape 54.9

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## MISSION RULES

### SECTION 7 - SLV - TB5 AND TB7

R	ITEM	SUMMARY OF COAST PHASE RULES						
		<p>7-1 INSUFFICIENT PROPELLANT</p> <p>7-2 LOSS OF ONE APS MODULE</p> <p>7-3 MAIN FUEL VALVE FAILS TO CLOSE</p> <p>7-4 MAIN OXIDIZER VALVE FAILS TO CLOSE</p> <p>7-5 RANGE SAFETY SYSTEM NOT SAFED AFTER INSERTION</p> <p>7-6 COLD HELIUM SHUTOFF VALVE FAILS OPEN</p> <p>7-7 AUXILIARY HYDRAULIC PUMP FAILS</p> <p>7-8 LOSS OF ATTITUDE CONTROL</p> <p>7-9 CONTINUOUS VENT REGULATOR FAILS TO OPEN</p> <p>7-10 APS ULLAGE ENGINE FAILS ON</p> <p>7-11 RESERVED</p> <p>7-12 J2 ENGINE MAIN FUEL VALVE OR MAIN OXIDIZER VALVE LEAKAGE IN TB5</p> <p>7-13 IU ENVIRONMENTAL CONTROL SYSTEM FAILS</p> <p>7-14 COMMON BULKHEAD ΔP</p> <p>7-15 LOSS OF S-IVB STAGE PNEUMATICS</p> <p>7-16 RESERVED</p> <p>7-17 LH<sub>2</sub> TANK VENT FAILURE OR LEAK</p> <p>7-18 LOW COLD HELIUM SUPPLY</p> <p>7-19 LOX TANK ULLAGE PRESSURE IS LESS THAN 31 PSIA</p> <p>7-20 J-2 ENGINE START BOTTLE PRESSURE OUTSIDE RESTART LIMITS</p> <p>7-21 PU VALVE FAILURE</p> <p>7-22 S-IVB CONFIRMED LOSS OF HYDRAULIC FLUID</p> <p>7-23 RESERVED</p> <p>7-24 RESERVED</p> <p>7-25 LOX NON-PROPULSIVE VENT FAILS TO OPEN</p> <p>7-26 LH<sub>2</sub> LATCHING VENT VALVE FAILS TO OPEN</p> <p>7-27 GH<sub>2</sub> START BOTTLE DUMP FAILS TO OCCUR</p> <p>7-28 COLD HELIUM DUMP FAILS TO OCCUR</p> <p>7-29 RESERVED</p> <p>7-30 RESERVED</p> <p>THE FOLLOWING MISSION RULES ALSO APPLY TO THIS SECTION:</p> <p>6-3 INERTIAL PLATFORM FAILURE - ACCELEROMETER</p> <p>6-4 LAUNCH VEHICLE INERTIAL PLATFORM FAILURE - ATTITUDE REFERENCE</p> <p>6-5 SIV B LOX CRYO REPRESS VALVE FAILS OPEN.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-1	Tape 57.6

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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-1	<p>PRIOR TO S-IVB RESTART, PROPELLANT QUANTITIES PRECLUDE ACHIEVEMENT OF AN ACCEPTABLE LUNAR MISSION AND:</p> <p>A. NO FAILURES HAVE BEEN IDENTIFIED WHICH RESULTED IN AN EXCESSIVE PROPELLANT IMBALANCE, AND INSUFFICIENT PROPELLANT REMAINS FOR ACHIEVEMENT OF AN ACCEPTABLE ALT MISSION</p> <p>B. FAILURES HAVE BEEN IDENTIFIED WHICH RESULTED IN AN EXCESSIVE IMBALANCE OF PROPELLANTS</p> <p>1. LOX DUMP WOULD SIGNIFICANTLY IMPROVE THE PROBABILITY OF A MINIMUM LUNAR LANDING OR A MINIMUM LO MISSION.</p> <p>2. LOX DUMP WOULD NOT SIGNIFICANTLY IMPROVE THE PROBABILITY OF A MINIMUM LO MISSION.</p>	EARTH ORBIT	<p><u>NO S-IVB RESTART/CONTINUE MISSION</u></p> <p>A. <u>NO S-IVB RESTART</u></p> <p>BSE INFORM FLT OF PREDICTED CAPABILITY</p> <p>B. <u>CONTINUE MISSION/NO S-IVB RESTART</u></p> <p>1. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLT AND CMD LOX DUMP TO MAXIMIZE ACCEPTABLE LUNAR MISSION CAPABILITY. IF C199-401 IS EXPECTED TO BE COLDER THAN 3200 R, OR C200-401 IS EXPECTED TO BE COLDER THAN 160° R AT ENGINE START, BSE CMD</p> <p>(A) MAINSTAGE ENABLE NO 2 ON</p> <p>(B) BURN MODE A ON</p> <p>2. <u>NO S-IVB RESTART</u></p> <p>BSE INFORM FLIGHT OF PREDICTED CAPABILITY.</p>	<p><u>CUES</u></p> <p>1. PROPELLANT REMAINING AS ASCERTAINED DURING R/T EVALUATIONS.</p> <p><u>NOTES</u></p> <p>1. FAILURES REQUIRING EVALUATION OF PROPELLANT REMAINING ARE DEFINED BY FMR'S 6-5, 6-7, 6-12, 7-3, 7-4, 7-6, 7-9, 7-12, 7-17, 7-18, 7-19, 7-21, 7-24, 7-30, 8-4.</p> <p>2. FAILURES WHICH RESULT IN A LOX DUMP REQUIREMENT ARE:</p> <p>(A) LOX CRYO REPRESS VALVES FAIL OPEN (FMR 6-5). OTBV FAILS OPEN DURING S-IVB FIRST BURN (FMR 7-30)</p> <p>(B) COLD HELIUM SHUTOFF VALVES FAIL OPEN (FMR 7-6)</p> <p>(C) LOW LOX TANK ULLAGE PRESS (FMR 7-18, 7-19)</p> <p>(D) J-2 ENGINE MAIN FUEL VLV FAILS TO CLOSE (FMR 7-3). DO NOT DUMP LOX IF MFV IS OPEN.</p> <p>(E) MRCV FAILS TO 4.5 POSITION (FMR 7-24)</p> <p>(F) LOX BLEED VLV FAILS OPEN (FMR 7-21)</p> <p>(G) OTBV FAILS OPEN (FMR 7-30)</p> <p>3. IMPLEMENTATION OF A LOX DUMP MAY REQUIRE A STATE VECTOR UPDATE.</p> <p>4. FAILURE MUST BE IDENTIFIED PRIOR TO CYI LOS.</p> <p>5. CORRECTIVE ACTION MUST BE TAKEN ON ITEMS 2(A), 2(B), 2(C), 2(D), 2(E), 2(F), 2(G), AS NOTED BY THE REFERENCED FMR.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-2	Tape 46.6





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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
7-4		<p>J-2 ENGINE MAIN OXIDIZER VALVE (MOV) FAILS TO CLOSE AT:</p> <p>A. FIRST S-IVB CUTOFF</p> <p>B. SECOND S-IVB CUTOFF</p> <p>C. AT END OF LOX DUMP</p>	<p>EARTH ORBIT</p> <p>TLC</p>	<p>A. <u>CONTINUE MISSION/NO S-IVB RESTART</u></p> <p>BSE INFORM FLIGHT AND COMMAND (ASAP)</p> <p>1. PREVALVES AND RECIRC SHUTOFF VALVES CLOSED</p> <p>2. ATTEMPT TO CLOSE MOV</p> <p>IF A.2 IS SUCCESSFUL, BSE INFORM FLIGHT AND COMMAND</p> <p>3. PREVALVES AND RECIRC SHUTOFF VALVES OPEN</p> <p>IF A.2 IS UNSUCCESSFUL, BSE INFORM FLIGHT AND RECOMMEND NO S-IVB RESTART</p> <p>B. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND:</p> <p>1. ATTEMPT TO CLOSE MOV IF UNSUCCESSFUL, BSE CMD ASAP IN TB 8</p> <p>2. ENGINE PUMP PURGE OFF</p> <p>BSE TERMINATE LOX DUMP 120 SEC AFTER GAS INGESTION OBSERVED BY COMMANDING: (SEE NOTE 3)</p> <p>3. PREVALVES AND RECIRC VALVES CLOSED</p> <p>C. CONTINUE MISSION BSE INFORM FLIGHT AND TERMINATE LOX DUMP 120 SEC AFTER GAS INGESTION OBSERVED BY COMMANDING:</p> <p>1. PREVALVES AND RECIRC VALVES CLOSED</p> <p>2. ATTEMPT TO CLOSE MOV</p> <p>IF C.2. IS SUCCESSFUL</p> <p>3. CLOSE PREVALVES AND RECIRC VALVES</p>	<p><u>CUES</u></p> <p>1. MAIN OXIDIZER VALVE POSITION (G3-401) INDICATES NOT FULL CLOSED.</p> <p>2. MAIN OXIDIZER VALVE OPEN-ON (K120-401).</p> <p>3. LOX FLOWMETER FLOWRATE FI-401 INDICATING FLOW.</p> <p>4. LOX INJECTOR PRESSURE (D0005-401)</p> <p><u>NOTES</u></p> <p>1. IF THE MOV IS OPEN, THE LOX PUMP INLET PRESSURE WILL GO TO ZERO AFTER COMMAND (A.1).</p> <p>2. THIS FAILURE WILL REQUIRE EVALUATION OF RESIDUALS TO DETERMINE ADEQUACY FOR TLI VELOCITY CUTOFF AND LUNAR IMPACT OPERATIONS.</p> <p>3. LOX DUMP WILL BE INITIATED 3.2 SEC EARLY.</p> <p>4. THIS FAILURE WILL REQUIRE REAL-TIME ASSESSMENT BY LUNAR IMPACT TEAM.</p>				
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-5	Tape 59.2



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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-7	S-IVB AUXILIARY HYDRAULIC PUMP FAILS						
		A. TO TURN OFF AS SEQUENCED	EARTH ORBIT	A. <u>CONTINUE MISSION</u> BSE INFORM FLIGHT AND ATTEMPT TO TURN OFF AUXILIARY HYDRAULIC PUMP AS SOON AS POSSIBLE	<u>CUES</u> A.1. SYSTEM PRESSURE (D41-403). 2. RESERVOIR LEVEL (L7-403). 3. AFT BATTERY NO. 2 CURRENT (M22-404). 4. HYDRAULIC RESERVOIR OIL PRESSURE (D42-403).  <u>NOTES</u> A. FAILURE TO TURN OFF HYDRAULIC PUMP DEPLETES AFT NO. 2 BATTERY IN APPROXIMATELY 90 MIN AND OVERHEATS HYDRAULIC SYSTEM IN APPROXIMATELY 70 MIN.			
		B. TO TURN ON		B. <u>CONTINUE MISSION</u> BSE INFORM FLIGHT AND 1. ATTEMPT TO TURN AUXILIARY HYDRAULIC PUMP ON	<u>CUES</u> B.1. SYSTEM PRESSURE (D41-403). 2. RESERVOIR OIL LEVEL (L7-403). 3. AFT BAT NO. 2 CURRENT (M22-404). 4. RESERVOIR PRESSURE (D42-403). 5. HYDRAULIC PUMP INLET OIL TEMP (C50-401). 6. RESERVOIR OIL TEMP (C51-403).			
		1. AS SEQUENCED AND THE RESERVOIR OIL TEMP IS BELOW OR PREDICTED TO BE BELOW 35° F BEFORE NEXT STATION AOS	TLI	BSE INFORM FLIGHT AND 2. COMMAND AUXILIARY HYDRAULIC PUMP OFF	5. HYDRAULIC PUMP INLET OIL TEMP (C50-401). 6. RESERVOIR OIL TEMP (C51-403).			
		2. AT TB6 + 3 MIN 39 SEC	TLI	BSE INFORM FLIGHT AND 2. COMMAND AUXILIARY HYDRAULIC PUMP OFF	5. HYDRAULIC PUMP INLET OIL TEMP (C50-401). 6. RESERVOIR OIL TEMP (C51-403).			
		C. TO TURN ON FOR LOX DUMP (J-2 ENGINE NOT CENTERED IN PITCH PLANE PRIOR TO LOX DUMP)	TLC	C. <u>CONTINUE MISSION</u>	C.1. ACTUATOR POSITION (G1-403) 2. SYSTEM PRESSURE (D41-403) 3. CHI MINUS THETA GREATER THAN 10 DEGREES (H60-603)			
		1. ENGINE GIMBAL ANGLE LESS THAN ±3 DEGREES		1. <u>CONTINUE MISSION</u> BSE INFORM FLIGHT	<u>NOTES</u> 1. A PITCH ACTUATOR DEFLECTION IN EXCESS OF ±3 DEGREES IS ONLY EXPECTED FOR THE FOLLOWING CONDITIONS: (A) ERRONEOUS COMMAND SIGNAL (B) ACTUATOR FAILURE			
		2. ENGINE GIMBAL ANGLE GREATER THAN ±3 DEGREES		2. <u>CONTINUE MISSION</u> BSE INFORM FLIGHT AND INHIBIT LOX DUMP	2. SINCE TWO APS ENGINES ARE AVAILABLE FOR ATTITUDE CONTROL IN THE YAW PLANE, ATTITUDE CONTROL IN THIS PLANE WILL BE MAINTAINED FOR AN ACTUATOR IN A HARDOVER CONDITION.			
		3. ATTITUDE ERROR GREATER THAN 10 DEGREES DURING DUMP		3. <u>CONTINUE MISSION</u> BSE INFORM FLIGHT AND TERMINATE LOX DUMP	3. IF APS PROPELLANT IS INSUFFICIENT AND EITHER CONDITION C.2. OR C.3. PRECLUDES LOX DUMP, CONSIDERATION WILL BE GIVEN TO CONDUCTING A CYCLE LOX DUMP TO ATTAIN THE REQUIRED ΔV FOR LUNAR IMPACT BASED ON REAL-TIME DECISION OF LUNAR IMPACT TEAM. 4. ANY TIME THE HYDRAULIC OIL TEMP (C51-403) DROPS BELOW 35° F, THE AUX HYDRAULIC PUMP SHOULD BE CYCLED.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-7	Tape 22.5

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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-8	LOSS OF ATTITUDE CONTROL DURING						
	A. TB5		EARTH ORBIT/TLC	<p>A. <u>SPACECRAFT GUIDANCE TAKEOVER/SPACECRAFT SEPARATION</u></p> <p>BSE INFORM FLIGHT AND RECOMMEND SPACECRAFT GUIDANCE TAKEOVER.</p> <p>IF UNSUCCESSFUL, BSE RECOMMEND SPACECRAFT SEPARATION</p>	<p><u>CUES</u></p> <p>A.1. ANGULAR RATES - PITCH (R4-602) OR YAW (R5-602) GREATER THAN 0.3 DEG/SEC AND NOT DECREASING, OR ROLL (R6-602, R12-602), GREATER THAN 0.5 DEG/SEC AND NOT DECREASING</p> <p>2. ANGULAR RATE - PITCH (R13-602) OR YAW (R8-602) GREATER THAN 0.3 DEG/SEC AND NOT DECREASING, OR ROLL (R12-602) GREATER THAN 0.5 DEG/SEC AND NOT DECREASING (SEE NOTE 3)</p> <p>3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE 2)</p>			
	B. TB6 TO TB6 + 9 MIN 20 SEC		TLI	<p>B. <u>TLI INHIBIT</u></p> <p>BSE INFORM FLIGHT AND RECOMMEND TLI INHIBIT</p>	<p>B.1. SAME AS A.1. ABOVE</p> <p>2. SAME AS A.2. ABOVE</p> <p>3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTES 2 AND 4)</p>			
	C. TB7		TLC	<p>C. <u>CREW DISCRETION</u></p> <p>BSE INFORM FLIGHT AND FIDO</p> <p>1. DO NOT START EVASIVE MANEUVER</p> <p>2. DO NOT INITIATE TB8</p> <p>3. BSE PERFORM NON-PROPULSIVE S-IVB SAFING BY GROUND COMMAND.</p>	<p>C.1. SAME AS A.1 ABOVE</p> <p>2. SAME AS A.2. ABOVE</p> <p>3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTES 2 AND 4)</p>			
	D. TB8		TLC	<p>D. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND FIDO AND TERMINATE</p> <p>1. LOX DUMP</p> <p>2. ULLAGE ENGINE BURNS</p> <p>3. LH2 CVS</p>	<p>D.1. SAME AS A.1. ABOVE</p> <p>2. SAME AS A.2. ABOVE</p> <p>3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTES 2 AND 4)</p> <p><u>NOTES</u></p> <p>1. IMMEDIATELY AFTER S-IVB CUTOFF, S/C RETURN OF CONTROL TO SATURN, OR DURING PROGRAMED MANEUVERS THE ABOVE RATE LIMITS ARE NOT APPLICABLE.</p> <p>2. LOSS OF ATTITUDE CONTROL ALERT WILL BE GIVEN FOR THE FOLLOWING CONDITIONS:</p> <p>(A) LVDC/LVDA COMPUTATIONAL FAILURE</p> <p>(B) ABNORMAL ATTITUDE ERROR SIGNALS</p> <p>(C) FAILURE TO INITIATE PROPER GUIDANCE SEQUENCE</p> <p>3. THESE CUES ARE VALID IF RATE CHANNEL SWITCHOVER HAS NOT OCCURRED.</p> <p>4. LOSS OF ATTITUDE CONTROL ALERT IS SUFFICIENT FOR IMPLEMENTING THIS RULE EXCEPT FOR PARTS B AND D.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-8	Tape 22.6

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MISSION RULES

SECTION 7 SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-9	CONTINUOUS VENT SYSTEM (CVS) REGULATOR FAILS TO OPEN IN TB5 (TB5 + 59 SEC)	EARTH ORBIT/ TLI	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND</p> <ol style="list-style-type: none"> <li>1. ATTEMPT TO OPEN CVS RELIEF OVERRIDE SHUTOFF VALVE</li> </ol> <p>IF UNSUCCESSFUL, BSE</p> <ol style="list-style-type: none"> <li>2. VENT THE LH2 TANK PRIOR TO TB6 + 8 MIN 40 SEC TO A VALUE BELOW THE PRESSURE REQUIRED FOR S-IVB RESTART.</li> </ol> <p>IF THE LH2 BLOWDOWN IS COMPLETED WITHIN 30 MINUTES PRIOR TO TB6 INITIATE, COMMAND</p> <ol style="list-style-type: none"> <li>3. ULLAGE ENGINES</li> </ol> <p>AFTER 90 SEC OF ULLAGE, SEND</p> <ol style="list-style-type: none"> <li>4. ULLAGE ENGINES OFF</li> </ol> <p>ULLAGING SHOULD BE COMPLETED PRIOR TO THE AMBIENT REPRESSURIZATION.</p> <p>IF EITHER ACTION 1 OR 2 IS UNSUCCESSFUL, BSE INFORM FLIGHT</p>	<p><u>CUES</u></p> <ol style="list-style-type: none"> <li>1. CVS NOZZLE PRESSURE (D181-409, D182-409).</li> <li>2. CVS REGULATOR CLOSED (K154-411).</li> <li>3. LH2 ULLAGE PRESSURE (D177-408, D178-408).</li> </ol> <p><u>NOTES</u></p> <ol style="list-style-type: none"> <li>1. IF THE CVS REGULATOR FAILS TO OPEN, THE LH2 SATURATION TEMPERATURE WILL INCREASE ABOVE NOMINAL RESTART LIMITS.</li> <li>2. COMMAND ACTION WILL REQUIRE EVALUATION OF LH2 RESIDUALS TO DETERMINE ADEQUACY FOR TLI VELOCITY CUTOFF.</li> <li>3. IF THE CVS REGULATOR IS CLOSED DURING ORBIT, THE IU STATE VECTOR WILL BE IN ERROR SINCE THE IU USES A STORED PROGRAM FOR THIS THRUST. A NAVIGATION UPDATE MAY BE REQUIRED (REF FMR 7-11).</li> </ol>			
	7-10	APS ULLAGE ENGINE(S) THRUST FAILS TO TERMINATE AT SEQUENCED TIMES	EARTH ORBIT/ TLI/TLC	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND ATTEMPT TO TERMINATE ULLAGE ENGINE THRUST.</p> <p>IF UNSUCCESSFUL, BSE INFORM FLIGHT OF IMPENDING LOSS OF ATTITUDE CONTROL CAPABILITY</p>	<p><u>CUES</u></p> <ol style="list-style-type: none"> <li>1. ULLAGE ENGINE THRUST CHAMBER PRESSURE (D220-414, D221-415).</li> <li>2. APS HELIUM SPHERE PRESSURE DECREASING (D35-414, D36-415, D250-414, D251-415).</li> </ol>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
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## MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-11	IU STATE VECTOR IS IN ERROR WHEN COMPARED TO MSFN STATE VECTOR (I.E., SOME COMPONENT OF IU PLATFORM AND/OR COMPUTER HAS FAILED OR EXHIBITS A LARGE ERROR)	LAUNCH	<p style="text-align: center;"><u>CONTINUE MISSION</u></p> <p>BSE XMIT IU NAV UPDATE BASED ON GUIDO RECOMMENDATION PER FMR 5-29</p>	<p><u>CUES</u></p> <p>IF IU AND MSFN <math>\Delta A</math>, <math>\Delta RV</math>, AND <math>\Delta \dot{W}</math> MAX DIFFER BY THE FOLLOWING AMOUNTS:</p> <ol style="list-style-type: none"> <li>1. AT T + 56 MIN                             <ul style="list-style-type: none"> <li>(A) <math>\Delta A = 1.1</math> NM</li> <li>(B) <math>\Delta RV = 33,101</math> FT</li> <li>(C) <math>\Delta \dot{W}</math> MAX = 9.0 FPS WHEN <math>\Delta W = 2307</math> FT</li> </ul> </li> <li>2. AT T + 1 HOUR 45 MIN                             <ul style="list-style-type: none"> <li>(A) <math>\Delta A = 1.21</math> NM</li> <li>(B) <math>\Delta RV = 56,894</math> FT</li> <li>(C) <math>\Delta \dot{W}</math> MAX = 9.0 FPS WHEN <math>\Delta W = 3857</math> FT</li> </ul> </li> </ol> <p><u>NOTES</u></p> <ol style="list-style-type: none"> <li>1. ANY HARDWARE FAILURE OR MALFUNCTION, SUCH AS CVS FAILURE, OR ACCELEROMETER FAILURE MAY BE CAUSE TO PERFORM A NAVIGATION UPDATE.</li> <li>2. THERE ARE TWO TIMES DURING EPO THAT THESE VECTOR COMPARISONS ARE MADE. THESE TIMES CORRESPOND TO A VECTOR TIME TAGGED AT TL + 56 MIN AND A VECTOR TIME TAGGED AT TL + 1 HR 45 MIN. THE VECTOR COMPARISONS WILL BE MADE ON THE FOLLOWING PARAMETERS:                             <ul style="list-style-type: none"> <li>(A) <math>\Delta A</math> - BASICALLY, THE DELTA SEMIMAJOR AXIS OF EPO</li> <li>(B) <math>\Delta RV</math> - THE LOCAL DELTA DOWNRANGE COMPONENT</li> <li>(C) <math>\Delta \dot{W}</math> MAX - THE LOCAL CROSSRANGE VELOCITY. THIS IS A FUNCTION OF W AND CHANGES AS W CHANGES.</li> </ul> </li> </ol>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-10	Tape 11D.6





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MISSION RULES

SECTION 7 - SLV - TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-13	<p>IU ECS WATER VALVE FAILS TO CYCLE OPEN OR CLOSE</p> <p>A. WATER VALVE CLOSED AND COOLANT INLET CONTROL TEMPERATURE IS 64° F OR HIGHER, AND THE INERTIAL GIMBAL TEMPERATURE IS 117° F OR HIGHER, OR THE LVDA MEMORY TEMP NO. 1 OR NO. 2 IS 147° F OR HIGHER, OR THE LVDC MEMORY TEMP IS 115° F OR HIGHER, OR THE LVDC LOGIC TEMP IS 142° F OR HIGHER, OR COOLANT MANIFOLD PUMP INLET PRESS IS 17.5 PSIA OR HIGHER.</p> <p>B. WATER VLV CLOSED AND COOLANT INLET CONTROL TEMP IS 64° F OR HIGHER, AND THE INERTIAL GIMBAL TEMP IS 149° F OR HIGHER, OR THE LVDA TEMP NO. 1 OR NO. 2 IS 147° F OR HIGHER, OR THE LVDC MEMORY TEMP IS 115° F OR HIGHER, OR THE LVDC LOGIC TEMP IS 142° F OR HIGHER, OR COOLANT MANIFOLD PUMP INLET PRESS IS 17.5 PSIA OR HIGHER.</p> <p>C. WATER VLV OPEN AND COOLANT INLET CONTROL TEMP IS 55° F OR LESS, AND THE INERTIAL GIMBAL TEMP IS 102° F OR LESS, OR THE LVDA TEMP NO. 1 OR NO. 2 IS 50° F OR LESS, OR THE LVDC MEMORY OR LOGIC TEMPS ARE 50° F OR LESS.</p>	<p>EARTH ORBIT TLI TO APS BURN NO. 1</p> <p>APS BURN NO. 1 TO EOM</p> <p>EARTH ORBIT TLI TLC</p>	<p>A. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND SEND</p> <p>1. ECS LOGIC INHIBIT COMMAND</p> <p>2. WATER VALVE OPEN</p> <p>B. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLT AND SEND:</p> <p>1. WATER VLV OPEN</p> <p>2. WATER VLV CLOSED WHEN THE TEMP WHICH WAS IN VIOLATION DECREASES 27° F OR IF VLV OPENED AS A RESULT OF PRESS VIOLATION, VLV WILL BE CLOSED WHEN PRESS DECREASES TO A NOMINAL LEVEL AND ANY ONE CRITICAL TEMP DECREASES 27° F.</p> <p>C. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLT AND SEND:</p> <p>1. ECS LOGIC INHIBIT CMD</p> <p>2. WATER VLV CLOSED</p>	<p><u>CUES</u></p> <p>1. WATER VALVE CLOSED/OPEN (G5-601, G6-601)</p> <p>2. COOLANT TEMP (C15-601)</p> <p>3. ST-124 INERTIAL GIMBAL TEMP (C34-603)</p> <p>4. SUBLIMATOR INLET TEMP (C11-601)</p> <p>5. LVDC MEMORY TEMP (C54-603)</p> <p>6. LVDA TEMP NO. 1 (C55-603)</p> <p>7. LVDA TEMP NO. 2 (C46-603)</p> <p>8. LVDC LOGIC TEMP (C53-603)</p> <p>9. COOLANT MANIFOLD INLET PRESS (D24-601)</p> <p><u>NOTE</u></p> <p>1. RULING "B" IS IN EFFECT ONLY IF ECS LOGIC HAS BEEN INHIBITED WITH THE WATER VLV IN THE CLOSED POSITION TO COMPENSATE FOR SUBLIMATOR VENTING FROM 15 MINUTES BEFORE APS BURN NO. 1 TO EOM.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-13	Tape 46.1

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MISSION RULES

SECTION 7 - SLV - TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING			CUES/NOTES/COMMENTS	
	7-14	<p>S-IVB STAGE COMMON BULKHEAD DELTA PRESSURE REACHES OR EXCEEDS:</p> <p>A. MINUS 20 PSID OR PLUS 30 PSID</p> <p>B. MINUS 26 PSID OR PLUS 36 PSID</p>	EARTH ORBIT TLC	<p>A. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND COMMAND</p> <p>LH2 AND/OR LOX VENT VALVES OPEN OR CLOSED TO PRECLUDE REACHING SEPARATION LIMITS</p> <p>B. <u>EMERGENCY SPACECRAFT SEPARATION</u></p> <p>BSE TRANSMIT ABORT REQUEST AND REQUEST EMERGENCY S/C SEPARATION.</p>			<p><u>CUES</u></p> <ol style="list-style-type: none"> <li>LH2 TANK ULLAGE PRESSURE (K177-408, D178-408).</li> <li>LOX TANK ULLAGE PRESSURE (D180-406, D179-406)</li> <li>LH2 PUMP INLET PRESSURE (D2-403).</li> <li>LOX PUMP INLET PRESSURE (D3-403).</li> </ol> <p><u>NOTES</u></p> <ol style="list-style-type: none"> <li>MINUS DELTA PRESSURE IS DEFINED AS A FUEL TANK ULLAGE PRESSURE GREATER THAN THE LOX TANK ULLAGE PRESSURE.</li> <li>PLUS DELTA PRESSURE IS DEFINED AS A LOX TANK ULLAGE PRESSURE GREATER THAN THE FUEL TANK ULLAGE PRESSURE.</li> <li>THE MINIMUM RECOMMENDED DISTANCE BETWEEN THE S-IVB AND THE SPACECRAFT IS 7,000 FT.</li> <li>THE BULKHEAD WILL STRUCTURALLY FAIL AT THE ULTIMATE LIMITS OF -32.5 PSID OR +42.0 PSID.</li> </ol>	
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-14	Tape 59.6

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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-15	S-IVB STAGE PNEUMATIC SUPPLY PRESSURE DECAY EXCESSIVE IN:  A. TB5          B. TB7	EARTH ORBIT          TLC	A. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND  1. ATTEMPT TO TERMINATE PUMP PURGE AND/OR CLOSE AMBIENT HELIUM SUPPLY SHUTOFF VALVE.  2. RE-OPEN AMBIENT HELIUM SUPPLY SHUTOFF VALVE WHEN PNEUMATICS REQUIRED  B. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND  1. OPEN PREVALVES AND CHILLDOWN SHUTOFF VALVES  IF EXCESSIVE PRESSURE DECAY CONTINUES, BSE  2. CLOSE AMBIENT HELIUM SUPPLY SHUTOFF VALVES  3. REOPEN AMBIENT HELIUM SUPPLY SHUTOFF VALVES WHEN PNEUMATICS REQUIRED.	<u>CUES</u>  1. ENGINE PUMP PURGE PRESSURE (D50-403)  2. AMBIENT HELIUM PNEUMATIC SPHERE PRESSURE (D236-403, D256-403).  3. LOX REPRESS SUPPLY PRESSURE (D88-403, D254-403).  <u>NOTE</u>  AN EXCESSIVE PNEUMATIC SUPPLY PRESSURE DECAY IS ONE WHICH WILL RESULT IN DEPLETION OF STAGE PNEUMATICS PRIOR TO COMPLETION OF TB8 FUNCTIONS.			
	7-16	CONTROL SIGNAL PROCESSOR NULL SHIFT IN TB7 OR TB8	TLC	<u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND COMMAND LADDER LIMITS TO 12.0 DEG	<u>CUES:</u>  1. PRIME RATE GYRO MINUS REFERENCE RATE GYRO GREATER THAN 0.3 DEG/SEC (PITCH, R4-602, R13-602; YAW, R5-602, R8-602; ROLL, R6-602, R12-602)  2. GUIDANCE CHI MINUS THETA GIMBAL ANGLE (H60-603) GREATER THAN 10 DEG AND NOT CONVERGING.  3. LADDER ERRORS GREATER THAN 1.6 DEG (H54-603, H55-603, H56-603) EXCEPT DURING PROGRAMED MANEUVER.  <u>NOTES</u>  1. IF BOTH RATE GYRO MEASUREMENTS ARE VALID, CUE 1 MUST BE USED.  2. FOR AS-511 ONLY, IF A NULL SHIFT OCCURS PRIOR TO TB6 - 9 SECONDS, A DCS CMD TO OPEN THE LADDER LIMITS TO 12 DEGREES MUST BE SENT AFTER TB6 - 9 SECONDS TO PREVENT THE LVDC FROM SWITCHING BACK TO THE LOWER LIMITS DURING TB7 AND TB8.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-15	Tape 11D.7

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## MISSION RULES

### SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-17	LH2 TANK ULLAGE PRESSURE LESS THAN 17 PSIA IN TB5	EARTH ORBIT/TLI	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND COMMAND</p> <p>1. LH2 TANK VENT VALVES BOOST CLOSE ON AND OFF AND/OR CVS REGULATOR CLOSED (ORIFICE OPEN) (NOTE 1).</p> <p>IF THE CONDITION CANNOT BE CORRECTED AND SUFFICIENT AMBIENT REPRESS HELIUM IS AVAILABLE, BSE</p> <p>2. INHIBIT O2/H2 BURNER</p>	<p><u>CUES</u></p> <p>1. LH2 ULLAGE PRESSURE (D177-408, D178-408).</p> <p>2. LH2 PUMP INLET PRESSURE (D2-403).</p> <p>3. LH2 VENT CLOSED DISCRETES (K1-410, K210-410).</p> <p><u>NOTES</u></p> <p>1. IF THE ULLAGE PRESSURE RISES ABOVE 21 PSIA AFTER THE REGULATOR HAS BEEN CLOSED, THE REGULATOR SHOULD BE CYCLED TO MAINTAIN A 17 TO 21 PSIA ULLAGE PRESSURE IN LH2 TANK.</p> <p>2. IF LH2 TANK ULLAGE PRESSURE IS EXPECTED TO BE LESS THAN 19.5 PSIA AT TB6 INITIATE, RESULTING PROPELLANT LOSSES SHOULD BE INCLUDED IN THE EVALUATION OF CAPABILITY TO ACHIEVE ACCEPTABLE ALTERNATE MISSION PER FMR 7-1.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-16	Tape 11D.8

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MISSION RULES

SECTION 7 - SLV - TB 5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
7-18	LOW COLD HELIUM SUPPLY PRESSURE A. PRIOR TO BURNER START  B. DURING BURNER OPERATION	EARTH ORBIT	A. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND COMMAND FROM LAST STATION PRIOR TO TB6  BURNER LOX SHUTDOWN VALVE CLOSE ON  B. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND CMD  LH2 AND LOX REPRESS VALVE CLOSED.	<u>CUE</u>  COLD HELIUM SPHERE PRESSURE (D261-403, D263-403).  <u>NOTE</u>  1. AN EXCESSIVE COLD HELIUM SUPPLY PRESSURE DECAY IS ONE WHICH WILL RESULT IN A COLD HELIUM BOTTLE PRESSURE OF LESS THAN 1000 PSIA AT TB6 INITIATE OR LESS THAN 450 PSIA AT COMPLETION OF CRYOGENIC REPRESSURIZATION.  2. THIS FAILURE WILL REQUIRE EVALUATION OF RESIDUALS TO DETERMINE ADEQUACY FOR TLI VELOCITY CUTOFF AND LUNAR IMPACT OPERATIONS (FMR 7-1).				
7-19	A. LOX TANK ULLAGE PRESSURE LESS THAN 31 PSIA DURING ORBITAL COAST OR EXPECTED TO BE LESS THAN 31 PSIA BY TB6 INITIATE	EARTH ORBIT	<u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND COMMAND  1. LOX TANK VENT VALVE BOOST CLOSE  IF LOX TANK ULLAGE PRESSURE IS NOT MORE THAN 9 PSI BELOW THE REQUIRED ULLAGE PRESSURE, BSE COMMAND  2. LOX TANK REPRESS CONTROL VALVE OPEN ON UNTIL TANK PRESSURE GREATER THAN REQUIRED, THEN OFF  3. DELETED  IF LOX TANK ULLAGE PRESSURE IS GREATER THAN 9 PSI BELOW THE REQUIRED ULLAGE PRESSURE, OR IF THE REQUIRED ULLAGE PRESSURE IS GREATER THAN THE FLIGHT CONTROL PRESSURE SWITCH SETTING, BSE COMMAND  4. BURNER LOX SHUTDOWN VALVE CLOSE  5. AS CLOSE AS POSSIBLE TO TB6 + 7 MIN 30 SEC, LOX AMBIENT REPRESS ON	<u>CUES</u>  1. LOX ULLAGE PRESSURE (D179-406, D180-406)  2. LOX PUMP INLET PRESSURE (D3-403)				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-17	Tape 11C.2

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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
7-20	J-2 ENGINE START BOTTLE PRESSURE OUTSIDE RE-START LIMITS  A. ABOVE 1450 PSIA DURING ORBITAL COAST FOR FIRST OPPORTUNITY RESTART OR ABOVE 1500 PSIA FOR SECOND OPPORTUNITY RESTART  B. ABOVE 1800 PSIA PRIOR TO RESTART  C. BELOW 800 PSIA (SEE NOTE)	EARTH ORBIT		<u>A. CONTINUE MISSION</u>  BSE INFORM FLIGHT AND SENT  1. START BOTTLE VENT OPEN FOR 3 SEC  2. REPEAT COMMAND AS NECESSARY TO INSURE A PRESSURE OF LESS THAN 1450 PSIA FOR FIRST OPPORTUNITY RESTART OR 1500 PSIA FOR SECOND OPPORTUNITY RESTART  <u>B. EMERGENCY SPACECRAFT SEPARATION</u>  BSE TRANSMIT ABORT REQUEST AND RECOMMEND EMERGENCY SPACECRAFT SEPARATION  <u>C. CONTINUE MISSION</u>  BSE INFORM FLIGHT AND COMMAND ASAP  1. START TANK RECHARGE ARM ON  2. START TANK VENT OPEN UNTIL TANK PRESSURE LESS THAN 300 PSIA, THEN CLOSE	<u>CUES</u>  START BOTTLE PRESSURE (D17-401, D241-401)  <u>NOTES</u>  1. EXCESSIVE START BOTTLE DECAY DURING ORBITAL COAST IS DEFINED AS A PRESSURE DECAY WHICH WILL RESULT IN A START BOTTLE PRESSURE BELOW 800 PSIA AT SECOND BURN ENGINE START COMMAND (TB6 + 9 MIN 30 SEC).  2. A START BOTTLE PRESSURE OF 300 PSIA MAXIMUM IS ALLOWABLE AT START BOTTLE RECHARGE COMMAND.			
7-21	LOX BLEED VLV FAILS OPEN DURING S-IVB FIRST BURN	LAUNCH		<u>CONTINUE MISSION</u>  BSE INFORM FLT ASAP AFTER CUTOFF, BSE:  1. CYCLE LOX BLEED VLV; IF 1. IS UNSUCCESSFUL, BETWEEN TB6 + 7 MIN 30 SEC AND TB6 + 9 MIN 30 SEC, BSE:  2. CLOSE MRCV (5.0 POSITION)	<u>CUES:</u>  1. OXIDIZER BLEED VLV CLOSED OFF (K126-401) DURING S-IVB FIRST BURN.  2. REDUCED ENGINE PERFORMANCE (REFER TO REAL-TIME PERFORMANCE RESULTS)  <u>NOTES:</u>  1. THIS FAILURE WILL RESULT IN PROPELLANT IMBALANCE AND WILL REQUIRE EVALUATION OF RESIDUALS TO DETERMINE ADEQUACY FOR TLI VELOCITY CUTOFF (REF FMR 7-1)			
7-22	S-IVB CONFIRMED LOSS OF HYDRAULIC FLUID	EARTH ORBIT/ TLI		<u>NO S-IVB RESTART (TB5)/TLI INHIBIT (TB6)</u>  BSE INFORM FLIGHT AND RECOMMEND NO S-IVB RESTART	<u>CUES</u>  1. HYDRAULIC RESERVOIR OIL LEVEL APPROX ZERO PERCENT (L7-403).  2. HYDRAULIC SYSTEM PRESSURE LESS THAN 1700 PSIA (D41-403).  3. HYDRAULIC RESERVOIR PRESSURE APPROXIMATELY ZERO PSIA (D42-403).  <u>NOTES</u>  IF L7-403 IS FUNCTIONING PROPERLY, IT IS REQUIRED FOR IMPLEMENTATION OF THIS RULE.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-23	LOSS OF ECS COOLANT CIRCULATION	EO TLI TLC	<u>CONTINUE MISSION</u>  BSE INFORM FLT AND SEND:  COOLANT PUMP NO. 1 ON AND PRESSURE SWITCH DEACTIVATE	<u>CUES:</u>  1. FLOW RATE IU EXIT COOLANT (F9-602) APPROXIMATELY 1.5 GPM.  2. FLOW RATE S-IVB INLET COOLANT (F10-601) APPROXIMATELY 1.5 GPM.  3. COOLANT MANIFOLD INLET PRESS. (D17-601) APPROXIMATELY 16 PSIA.  4. COOLANT PUMP NO. 2 POWER ON (K161-601) +28 VDC  5. COOLANT PUMP INLET PRESS (D24-601) APPROXIMATELY 16 PSIA.			
	7-24	MIXTURE RATIO CONTROL VLV (MRCV) FAILS OPEN (4.5 POSITION) DURING S-IVB FIRST BURN	LAUNCH	<u>CONTINUE MISSION</u>  BSE INFORM FLT ASAP AFTER FIRST ENGINE CUTOFF, BSE:  CYCLE MRCV	<u>CUES:</u>  1. MIXTURE RATIO CONTROL VLV POSITION (G17-401) DOES NOT INDICATE 5.0 POSITION.  2. MRCV OPEN ON (K219-404) (4.5 POSITION).  3. FAILURE VERIFIED BY ENGINE PERFORMANCE (REFER TO REAL-TIME ENGINE PERFORMANCE RESULTS).  <u>NOTES:</u>  THIS FAILURE WILL RESULT IN PROPELLANT IMBALANCE AND WILL REQUIRE EVALUATION OF RESIDUALS TO DETERMINE ADEQUACY FOR TLI VELOCITY CUTOFF (REF FMR 7-1)			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-25	S-IVB STAGE LOX NON-PROPULSIVE VENT (NPV) FAILS  A. TO OPEN AT TB7 + 0.7 SEC  B. TO LATCH OPEN AT TB8 + 28 MIN 10 SEC	TLC  TLC	A. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND VENT THE LOX TANK TO 18-20 PSIA PRIOR TO TB7 + 15 MIN.  B. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND  1. ATTEMPT TO LATCH OPEN THE LOX VENT  IF UNSUCCESSFUL, BSE COMMAND AT TB8 +26 MIN 15 SEC  2. LH2 LATCHING VENT VALVE CLOSED	<u>CUES</u>  1. LOX NPV NOZZLE PRESSURES (D243-404, D244-404).  2. LOX TANK ULLAGE PRESSURE (D180-406, D179-406).  3. LOX NPV OPEN DISCRETES (K198-424, K199-424).			
	7-26	LH2 LATCHING VENT VALVE FAILS TO LATCH OPEN AS PROGRAMED  A. IN TB7  B. IN TB8	TLC	A. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND  1. ATTEMPT TO OPEN THE LH2 LATCHING VENT VALVE  IF UNSUCCESSFUL, BSE COMMAND  2. LH2 LATCHING VENT VALVE CLOSED  3. LH2 VENT VALVE OPEN  AT TB7 + 15 MIN OR TB7 + 1 HR 15 MIN COMMAND  4. LH2 VENT VALVE CLOSE  B. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND  1. ATTEMPT TO LATCH OPEN THE LH2 LATCHING VENT VALVE  IF UNSUCCESSFUL, BSE COMMAND (ASAP)  2. LOX NPV UNLATCHED AND CLOSED	<u>CUES</u>  1. LH2 NPV NOZZLE PRESSURE (D183-409, D184-409).  2. LH2 ULLAGE PRESSURE (D177-408, D178-408).  3. LH2 LATCHING VENT VALVE DISCRETES (K210-410, K211-410).  4. LH2 PUMP INLET PRESSURE (D2-403)			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-20	Tape 23.7

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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-27	ENGINE START BOTTLE DUMP FAILS TO INITIATE	TLC	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND ATTEMPT TO OPEN THE START BOTTLE VENT VALVE FOR A MINIMUM OF 40 SECONDS</p>	<p><u>CUES</u></p> <p>GH2 START BOTTLE PRESSURE (D17-401, D241-401).</p> <p><u>NOTES</u></p> <p>THE MAXIMUM SAFE PRESSURE LIMIT TO PRECLUDE REACHING BOTTLE PROOF PRESSURE PRIOR TO LUNAR IMPACT IS 615 PSIA.</p>			
	7-28	S-IVB STAGE COLD HELIUM DUMP FAILS TO INITIATE	TLC	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND</p> <p>1. ATTEMPT TO INITIATE THE COLD HELIUM DUMP THROUGH LH2 COIL ON O2/H2 BURNER FOR A MINIMUM OF 45 MINUTES</p> <p>IF UNSUCCESSFUL, BSE INFORM FLIGHT AND, AFTER LOX NPV OPEN IN TB8, COMMAND</p> <p>2. LOX PRESSURIZATION SHUTOFF VALVES OPEN FOR A MINIMUM OF 30 MINUTES</p>	<p><u>CUE</u></p> <p>COLD HELIUM BOTTLE PRESSURE (D261-403, D263-403).</p> <p><u>NOTE</u></p> <p>THE MAXIMUM SAFE PRESSURE LIMIT TO PRECLUDE REACHING BOTTLE PROOF PRESSURE PRIOR TO LUNAR IMPACT IS <u>100</u> PSIA.</p>			
	7-29	ENG HELIUM CONTROL VLV LEAKING AFTER FIRST ENGINE CUTOFF	EO	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLT AND:</p> <p>1. CYCLE ENG HELIUM CONTROL VLV (NOTE 1)</p> <p>IF EITHER BLEED VALVE IS CLOSED, REFER TO FMR 8-3 OR 8-4</p>	<p><u>CUES:</u></p> <p>1. ENG REG OUTLET PRESS (D018-401) 60 PSIA OR GREATER</p> <p>2. ENG CONTROL HELIUM PRESS (D019-401, D242-401) DECREASING</p> <p>3. FUEL TK HELIUM REPRESS SPHERE PRESS (D20-403, D249-403)</p> <p>4. BLEED VLVS CLOSED (K126-401, K127-401)</p> <p><u>NOTES:</u></p> <p>1. RULING 1 MAY BE REPEATED AT DISCRETION OF BSE IN AN EFFORT TO TERMINATE LEAKAGE.</p> <p>2. RULINGS 1 THROUGH 4 MUST BE TAKEN PRIOR TO LOS AFTER FIRST ENGINE CUTOFF.</p> <p>3. MOV MUST BE CLOSED PRIOR TO RESTART AS MOV OPEN VIOLATES FMR 7-4.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-21	Tape 59.8

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MISSION RULES

SECTION 7 - SLV - TB5 AND TB7 - CONCLUDED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	7-30	OXIDIZER TURBINE BYPASS VLV (OTBV) FAILS OPEN DURING S-IVB FIRST BURN	LAUNCH	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLT AS SOON AS POSSIBLE AFTER FIRST BURN CUT-OFF, BSE:</p> <ol style="list-style-type: none"> <li>1. CLOSE PREVALVES AND RECIRC VALVES</li> <li>2. DRAIN AND PURGE LOX SYS</li> <li>3. DRAIN LH2 SYSTEM AND PURGE (SEE NOTE 3)</li> <li>4. CYCLE OTBV</li> <li>5. RETURN SYSTEM TO NORMAL</li> </ol> <p>IF CYCLE OF OTBV IS UNSUCCESSFUL, BETWEEN TB6 + 7 MIN 30 SEC AND TB6 + 9 MIN 30 SEC, BSE:</p> <ol style="list-style-type: none"> <li>6. CLOSE MRCV (5.0 POSITION)</li> </ol>	<p><u>CUES:</u></p> <ol style="list-style-type: none"> <li>1. OTBV POSITION (G8-401) INDICATES OPEN DURING S-IVB FIRST BURN.</li> <li>2. OTBV CLOSED OFF (K125-401) DURING S-IVB FIRST BURN.</li> <li>3. REDUCED ENG PERFORMANCE (REFER TO R/T ENGINE PERFORMANCE RESULTS).</li> </ol> <p><u>NOTES:</u></p> <ol style="list-style-type: none"> <li>1. THIS FAILURE WILL RESULT IN PROPELLANT IMBALANCE AND WILL REQUIRE EVALUATION OF RESIDUALS TO DETERMINE ADEQUACY FOR TLI VEL. CUTOFF (REF FMR 7-1)</li> <li>2. THIS RULE MUST BE IMPLEMENTED AS SOON AS POSSIBLE AFTER C/O.</li> <li>3. THE ENGINE PUMP PURGE MUST BE OFF PRIOR TO CYCLING THE OTBV TO PREVENT BACKFLOW OF GASES TO THE GG WHEN OTBV CYCLED.</li> </ol>			
	7-31	LOW APS HELIUM SUPPLY SUPPLY PRESSURE	EARTH ORBIT/ TLI	<p><u>CONTINUE MISSION</u></p> <p>IF APS HELIUM BOTTLE PRESSURE IS EXPECTED TO BE BELOW 350 PSIA PRIOR TO THE NEXT GROUND STATION, BSE INFORM FLIGHT AND RECHARGE APS HELIUM BOTTLE AS REQUIRED TO MAINTAIN ATTITUDE CONTROL.</p>	<p><u>CUES:</u></p> <ol style="list-style-type: none"> <li>1. HELIUM SUPPLY PRESSURE MODULE 1 (D0035-414; D0250-414); MODULE 2 (D00036-415; D0251-415).</li> </ol>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB5 AND TB7		7-22	Tape 59.9

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## MISSION RULES

### SECTION 8 - SLV - TB6

R	ITEM	SUMMARY OF RESTART PHASE RULES						
		<p>8-1 RESERVED</p> <p>8-2 O<sub>2</sub>/H<sub>2</sub> BURNER LH<sub>2</sub> VALVE FAILS</p> <p>8-3 LH<sub>2</sub> CHILLDOWN SYSTEMS FAILS</p> <p>8-4 LOX CHILLDOWN SYSTEM FAILS</p> <p>8-5 RESERVED</p> <p>8-6 S-IVB ACTUATOR HARDOVER</p> <p>8-7 CONTINUOUS VENT REGULATOR FAILS TO CLOSE</p> <p>8-8 LOSS OF ATTITUDE CONTROL DURING SECOND BURN</p> <p>THE FOLLOWING MISSION RULES ALSO APPLY TO THIS SECTION:</p> <p>6-3 INERTIAL PLATFORM FAILURE - ACCELEROMETER</p> <p>6-4 LAUNCH VEHICLE INERTIAL PLATFORM FAILURE ATTITUDE REFERENCE</p> <p>6-11 S-IVB STAGE LOSS OF THRUST</p> <p>7-2 LOSS OF ONE APS MODULE</p> <p>7-7 S-IVB AUXILIARY HYDRAULIC PUMP FAILS</p> <p>7-8 LOSS OF ATTITUDE CONTROL DURING TB6 TO TB6 + 9 MIN 10 SEC (CREW IMPLEMENTATION)</p> <p>7-9 CONTINUOUS VENT REGULATOR FAILS TO OPEN</p> <p>7-13 IU ECS WATER VALVE FAILS TO CYCLE OPEN AND CLOSED</p> <p>7-14 S-IVB STAGE COMMON BULKHEAD DELTA PRESSURE REACHES OR EXCEEDS -20 PSID OR +36 PSID (CREW IMPLEMENTATION) OR +30 PSID, -26 PSID</p> <p>7-17 LH<sub>2</sub> TANK VENT FAILURE OR LEAK DURING ORBITAL COAST</p> <p>7-18 LOW COLD HELIUM SUPPLY PRESSURE</p> <p>7-19 LOX TANK ULLAGE PRESSURE LOW (CREW IMPLEMENTATION)</p> <p>7-20 J-2 ENGINE START BOTTLE PRESSURE OUTSIDE RESTART LIMITS</p> <p>7-22 S-IVB LOSS OF ENGINE HYDRAULIC FLUID</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB6		8-1	Tape 27.1

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MISSION RULES

SECTION 8 - SLV - TB6 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	8-1	RESERVED						
	8-2	S-IVB STAGE O2/H2 BURNER FUEL PROPELLANT VALVE FAILS CLOSED  A. PRIOR TO TB6 + 341 SEC          B. AFTER TB6 + 341 SEC	TLI	A. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND COMMAND  1. BURNER SHUTDOWN  2. CONTINUOUS VENT SYSTEM ORIFICE OPEN  3. LH2 REPRESSURIZATION CONTROL VALVE CLOSE  4. LOX REPRESSURIZATION CONTROL VALVE CLOSE  B. <u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND COMMAND  1. BURNER SHUTDOWN  2. APSULLAGE ENGINES ON  3. LH2 REPRESSURIZATION CONTROL VALVE CLOSE  4. LOX REPRESSURIZATION CONTROL VALVE CLOSE	<u>CUES</u>  A AND B  1. BURNER CHAMBER DOME TEMPERATURE (C2034-403, C382-403).  2. BURNER PROPELLANT VALVE POSITIONS (K180-404, K192-403, K181-404)  3. AMBIENT REPRESSURIZATION MODE SELECT (K195-404).  <u>NOTE</u>  THE O2/H2 BURNER VOTING CIRCUIT WILL NOT DETECT FAILURE OF THE BURNER TO IGNITE OR BURNER FLAME-OUT IN THE EVENT THE FUEL PROPELLANT VALVE FAILS CLOSED.			
	8-3	LH2 CHILLDOWN SYSTEM FAILS DURING RESTART PREPARATIONS	TLI	<u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND  1. ATTEMPT TO CORRECT SITUATION SPECIFIED IN NOTE A, B, D  IF UNSUCCESSFUL, BSE INFORM FLIGHT	<u>CUES</u>  1. LH2 PUMP INLET TEMP (C3-403).  2. LH2 RECIRC FLOW (F5-404).  3. LH2 PREVALVE DISCRETES (K111-404, K112-404).  4. LH2 BLEED VALVE CLOSE (K127-401).  5. LH2 RECIRC VALVE CLOSE (K136-409).  6. LH2 ULLAGE PRESS TO LH2 PUMP INLET PRESS ΔP (D177-408; D178-408; D2-403).  <u>NOTE</u>  LH2 CHILLDOWN WILL NOT BE SATISFACTORY IF  A. PREVALVE IS OPEN  B. RECIRCULATION VALVE IS CLOSED  C. BLEED VALVE IS CLOSED  D. CHILLDOWN PUMP IS NOT ON			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB6		8-2	Tape 11C.3

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MISSION RULES

SECTION 8 - SLV - TB6 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	8-4	S-IVB STAGE LOX CHILLDOWN SYSTEM FAILS DURING RESTART PREPARATIONS	TLI	<p><u>CONTINUE MISSION/TLI INHIBIT</u></p> <p>BSE INFORM FLIGHT AND</p> <p>1. ATTEMPT TO CORRECT SITUATION SPECIFIED IN NOTES 1.A, 1.B, 1.D</p> <p>IF 1 IS UNSUCCESSFUL, BSE INFORM FLIGHT AND BETWEEN TB6 + 4 MIN 10 SEC AND TB6 + 7 MIN 37.8 SEC COMMAND</p> <p>2. ALTERNATE SEQUENCE 6D</p> <p>IF LOX LEAD EXCEEDS 20 SEC, BSE INFORM FLIGHT AND</p> <p>3. RECOMMEND TLI INHIBIT</p>	<p><u>CUES FOR CHILLDOWN FAILURE</u></p> <p>1. LOX CHILLDOWN FLOW RATE (F4-424).</p> <p>2. LOX ULLAGE PRESSURE TO LOX DUMP INLET PRESSURE ΔP (D179-406, D180-406, D003-403).</p> <p>3. LOX PUMP INLET TEMP NOT DECREASING (C4-403).</p> <p>4. LOX PREVALVE DISCRETES (K109-403, K110-403).</p> <p>5. LOX BLEED VALVE CLOSED (K126-401).</p> <p>6. LOX RECIRCULATION VALVE CLOSED (K139-424).</p> <p><u>CUES FOR MOV FAILURE</u></p> <p>1. MOV POSITION INDICATES NOT FULL CLOSED (G3-401).</p> <p>2. MOV OPEN DISCRETE ON (K120-401).</p> <p>3. LOX FLOWMETER (F1-401) INDICATES FLOW.</p> <p>4. LOX INJECTOR PRESSURE (D005-401).</p> <p><u>NOTES</u></p> <p>1. LOX CHILLDOWN WILL NOT BE SATISFACTORY IF</p> <p>(A) PREVALVE IS OPEN</p> <p>(B) RECIRCULATION VALVE IS CLOSED</p> <p>(C) BLEED VALVE IS CLOSED</p> <p>(D) CHILLDOWN PUMP IS NOT ON</p> <p>2. ALTERNATE SEQ 6D COMMAND WILL ENABLE AN ONBOARD PROGRAMED 8 SEC LOX LEAD BEGINNING AT TB6 + 7 MIN 37.8 SEC.</p> <p>3. THIS FAILURE WILL REQUIRE EVALUATION OF RESIDUALS TO DETERMINE ADEQUACY FOR TLI VELOCITY CUTOFF AND LUNAR IMPACT OPERATIONS.</p>			
	8-5	RESERVED						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB6		8-3	Tape 27.3

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MISSION RULES

SECTION 8 - SLV - TB6 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
8-6		S-IVB ACTUATOR CONFIRMED HARDOVER PRIOR TO TLI IGN AND AUXILIARY HYDRAULIC PUMP IS OPERATING	TLI	<p>CONTINUE MISSION/TLI INHIBIT/CUTOFF</p> <p>A. <u>CONTINUE MISSION</u></p> <p>IF TIME PERMITS, SET UP FOR THE CREW TO ATTEMPT TO GIMBAL THE ENGINE WITH THE ROTATIONAL HAND CONTROLLER</p> <p>IF THERE IS NOT TIME, OR IF UNSUCCESSFUL,</p> <p>B. <u>TLI INHIBIT/CUTOFF</u></p> <p>BSE INFORM FLIGHT AND RECOMMEND TLI INHIBIT/CUTOFF AND IMPLEMENT THE ABOVE PROCEDURE</p>	<p><u>CUE</u></p> <p>ACTUATOR POSITIONS ±5 DEG OR GREATER (G1-400, G1-403, G2-400, G2-403).</p> <p><u>NOTE</u></p> <p>BOTH INDIVIDUAL PITCH/YAW ACTUATOR POSITION INDICATORS MUST CONFIRM MALFUNCTION PRIOR TO IMPLEMENTATION OF THE RULE.</p>				
8-7		<p>S-IVB STAGE CONTINUOUS VENT MODULE</p> <p>A. REGULATOR FAILS TO CLOSE DURING RESTART SEQUENCE</p> <p>B. REGULATOR FAILS TO CLOSE OR ORIFICE SHUTOFF VALVE FAILS TO CLOSE AT TB7 + 2 MIN 30.9 SEC (SEE NOTE)</p>	TLI	<p>A. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND</p> <p>1. ATTEMPT TO CLOSE THE CVS REGULATOR</p> <p>IF 1 IS UNSUCCESSFUL, BSE INFORM FLIGHT AND COMMAND</p> <p>2. O2/H2 BURNER SHUTDOWN</p> <p>B. <u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND</p> <p>1. ATTEMPT TO CLOSE THE CVS REGULATOR OR THE CVS ORIFICE SHUTOFF VALVE</p> <p>IF 1 IS UNSUCCESSFUL, BSE COMMAND AT TB7 + 15 MIN AND TB7 + 1 HR 15 MIN</p> <p>2. LH2 LATCHING VENT VALVE OPEN AND LATCH</p>	<p><u>CUES</u></p> <p>A.1. CVS NOZZLE PRESSURE REMAINS GREATER THAN 3 PSIA (D181-409 THROUGH D182-409).</p> <p>2. CVS REGULATOR CLOSED (K154-411).</p> <p>3. LH2 TANK ULLAGE PRESSURE (D177-408, D178-408).</p> <p>B.1. LH2 TANK CONTINUOUS VENT ORIFICE SHUTOFF VALVE CLOSED (K0155-411).</p> <p>2. CVS NOZZLE PRESSURE DOES NOT DECREASE TO 0 PSIA AT TB7 + 2 MIN 30.9 SEC (D0181-409, D0182-409).</p> <p><u>NOTE</u></p> <p>THIS FAILURE WILL REQUIRE RE-EVALUATION OF ΔV REQUIRED FOR LUNAR IMPACT.</p>				
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	SLV - TB6		8-4	Tape 27.4

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MISSION RULES

SECTION 8 - SLV - TB6 - CONCLUDED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	8-8	LOSS OF ATTITUDE CONTROL DURING S-IVB SECOND BURN	TLI	<p><u>CONTINUE MISSION</u></p> <p>BSE INFORM FLIGHT AND FIDO</p> <p>CREW WILL TAKE ACTION ON LIMITS (NOTE 1)</p>	<p><u>CUES</u></p> <ol style="list-style-type: none"> <li>1. ANGULAR RATES - PITCH (R4-602), YAW (R5-602), OR ROLL (R6-602) GREATER THAN 5 DEG/SEC AND NOT DECREASING.</li> <li>2. ANGULAR RATES - PITCH (R13-602), YAW (R8-602), OR ROLL (R12-602) GREATER THAN 5 DEG/SEC AND NOT DECREASING (SEE NOTE 3).</li> <li>3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE 2).</li> </ol> <p><u>NOTES</u></p> <ol style="list-style-type: none"> <li>1. TLI BURN WILL BE TERMINATED FOR                     <ol style="list-style-type: none"> <li>(A) PITCH OR YAW BODY RATES GREATER THAN ±10 DEG/SEC</li> <li>(B) ROLL BODY RATE GREATER THAN ±20 DEG/SEC</li> <li>(C) PITCH OR YAW ATTITUDE DEVIATION FROM NOMINAL PROFILES GREATER THAN 45 DEG</li> </ol> </li> <li>2. LOSS OF ATTITUDE CONTROL ALERT WILL BE GIVEN FOR THE FOLLOWING CONDITIONS:                     <ol style="list-style-type: none"> <li>(A) LVDC/LVDA COMPUTATIONAL FAILURE.</li> <li>(B) ATTITUDE ERROR SIGNALS-ROLL GREATER THAN ±3.5 DEG, PITCH AND YAW GREATER THAN ±5 DEG.</li> <li>(C) FAILURE TO INITIATE PROPER GUIDANCE SEQUENCE.</li> <li>(D) FAILURE OF S-IVB ENGINE HYDRAULICS.</li> </ol> </li> <li>3. THE CUES ARE VALID IF RATE CHANNEL SWITCHOVER HAS NOT OCCURRED.</li> <li>4. ROLL ATTITUDE ERRORS &gt;3.5 DEG. MAY BE A RESULT OF LOSS OF BOTH APS MODULES. THE CREW SHOULD ATTEMPT ROLL CONTROL WITH RCS.</li> </ol>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB6		8-5	Tape 11C.4

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## MISSION RULES

### SECTION 9 - SLV - TB8

R	ITEM	SUMMARY OF SAFING AND SLINGSHOT RULES					
		<p>9-1 STAGE PNEUMATIC DUMP FAILS</p> <p>9-2 LOX DUMP FAILS</p> <p>9-3 ENGINE CONTROL BOTTLE DUMP FAILS</p> <p>9-4 RESERVED</p> <p>9-5 RESERVED</p> <p>THE FOLLOWING REFERENCED FLIGHT MISSION RULES ARE ALSO APPLICABLE DURING TIME BASE EIGHT (TB8):</p> <p>7-3 J-2 ENGINE MAIN FUEL VALVE (MFV) FAILS TO CLOSE AT FIRST S-IVB CUTOFF, SECOND S-IVB CUTOFF</p> <p>7-4 J-2 ENGINE MAIN OXIDIZER VALVE FAILS TO CLOSE AT FIRST S-IVB CUTOFF, SECOND BURN CUTOFF</p> <p>7-8 LOSS OF ATTITUDE CONTROL DURING TB5 AND TB7 TO SPACECRAFT SEPARATION, TB6 TO TB6 + 9 min 20 SEC AFTER SPACECRAFT SEPARATION, AFTER TB8 INITIATE</p> <p>7-13 IU ECS VALVE FAILS TO CYCLE OPEN AND CLOSED</p> <p>7-14 S-IVB STAGE COMMON BULKHEAD DELTA PRESSURE REACHES OR EXCEEDS -20 PSID OR +30 PSID, -26 PSID OR +36 PSID</p> <p>7-25 S-IVB STAGE LOX NON-PROPULSIVE VENT (NPV) FAILS TO OPEN AT TB7 + 0.7 SEC, TO LATCH OPEN AT TB8 +17 MIN 3 SEC</p> <p>7-26 LH<sub>2</sub> LATCHING VENT VALVE FAILS TO LATCH OPEN AS PROGRAMED</p> <p>7-28 S-IVB STAGE COLD HELIUM DUMP FAILS TO INITIATE</p>					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	SLV - TB8		9-1
		Tape 27.6					

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## MISSION RULES

### SECTION 9 - SLV - TB8 - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	9-1	S-IVB STAGE PNEUMATIC DUMP FAILS TO INITIATE	TLC	<u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND ATTEMPT TO OPEN THE ENGINE PUMP PURGE CONTROL VALVE	<u>CUES</u> 1. ENGINE PUMP PURGE PRESSURE (D50-403). 2. AMBIENT HELIUM SUPPLY PRESSURE (D236-403, D256-403).  <u>NOTES</u> THE STAGE PNEUMATIC BOTTLE WILL BE SAFE AT LIFTOFF AND WILL NOT REACH PROOF PRESSURE PRIOR TO LUNAR IMPACT.			
	9-2	S-IVB LOX DUMP FAILS TO INITIATE	TLC	<u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND ATTEMPT TO INITIATE THE REQUIRED LOX DUMP	<u>CUES</u> 1. MAIN OXIDIZER VALVE POSITION (G3-401). 2. MAIN OXIDIZER VALVE OPEN DISCRETE (K120-401). 3. LOX PUMP INLET TEMPERATURE (C4-403). 4. LOX FLOW RATE (F1-401). 5. LOX PREVALVE OPEN DISCRETE (K109-403). 6. LOX PREVALVE CLOSE DISCRETE (K110-403).  <u>NOTES</u> 1. LOX DUMP WILL FAIL TO INITIATE IF (A) THE MOV REMAINS CLOSED (B) THE LOX PREVALVE REMAINS CLOSED 2. IF A LOX DUMP IS UNSUCCESSFUL, A RE-EVALUATION OF THE LUNAR IMPACT ΔV WILL BE REQUIRED.			
	9-3	ENGINE CONTROL BOTTLE DUMP FAILS TO INITIATE	TLC	<u>CONTINUE MISSION</u>  BSE INFORM FLIGHT AND ATTEMPT TO OPEN THE ENGINE HELIUM CONTROL VALVE	<u>CUES</u> 1. ENGINE CONTROL REG PRESS (D18-401). 2. ENGINE CONTROL HELIUM SPHERE PRESSURE (D19-401, D242-401).  <u>NOTES</u> THE MAXIMUM SAFE PRESSURE LIMIT TO PRECLUDE REACHING BOTTLE PROOF PRESSURE PRIOR TO LUNAR IMPACT IS <u>2300</u> PSIA.			
		RULES 9-4 AND 9-5 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SLV - TB8		9-2	Tape 27.7

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## MISSION RULES

SECTION 9 - SLV - TBB - CONCLUDED

R	ITEM	PRELAUNCH INSTRUMENTATION						
		MEASUREMENT DESCRIPTION	MEAS NUMBER	ONBOARD	TRANSDUCERS	CATEGORY	EFFEC-TIVITY	MISSION RULE REF
		STAGE COMMUNICATIONS SYSTEM AND FLIGHT CONTROL MEASUREMENT CATEGORIZATION						
		<u>STAGE COMMUNICATIONS SYSTEM</u>						
		S-II STAGE						
		LINK BP1					HD	
		MUX BP1AO					HD	
		MUX BP1BO					HD	
		MUX CP1AO					HD	
		S-IVB STAGE						
		LINK CP1					HD	
		MUX DP1BO (VIA IU)					M	
		MUX CP1BO					HD	
		INSTRUMENT UNIT						
		LINK DP1					HD	
		LINK DP1B					M	
		MUX CP1AO (VIA S-IVB)					HD	
		MUX DP1AO					HD	
		EMERGENCY DETECTION SYSTEM (EDS)						
							M	
		COMMAND COMMUNICATIONS SYSTEM (CCS) UPLINK						
							M	
		<u>FLIGHT CONTROL MEASUREMENTS</u>						
		S-IVB STAGE						
		PRESS, FUEL PUMP INLET	D2-403					7-14
		PRESS, FUEL TANK ULLAGE EDS 1	D177-408	METER*	COMMON	2 OF 3		7-14
		PRESS, FUEL TANK ULLAGE EDS 2	D178-408	METER*	COMMON	M		7-14/19
		PRESS, OXID PUMP INLET	D3-403					
		PRESS, OXID TANK ULLAGE EDS 1	D179-406	METER*	COMMON	2 OF 3		7-14/19,8-5
		PRESS, OXID TANK ULLAGE EDS 2	D180-406	METER*	COMMON	M		7-14/19,8-5
		INSTRUMENT UNIT						
		GUIDANCE COMPUTER OPERATION	H60-603				M	6-1/4/7/9, 7-8/11,8-1/8
		COMPUTER RESET PULSE NO. 1-GUIDANCE DECODER	J71-603					REQUIRED TO COMPLETE MULTIPLE WORD GROUND COMMANDS
		COMPUTER RESET PULSE NO. 2-GUIDANCE DECODER	J72-603			1 OF 2 M		
		*ONBOARD DISPLAY MANDATORY						

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM

R	ITEM							
		<u>GENERAL</u>						
	10-1	<p><u>LAUNCH</u></p> <p>LAUNCH WILL BE CONTINUED AS LONG AS THE SUIT CIRCUIT AND O<sub>2</sub> SUPPLY WILL SUPPORT FLIGHT CREW DEMANDS FOR AT LEAST ONE REV AND ENTRY INTO 2-1. THERE ARE NO COOLANT FAILURES FOR WHICH LAUNCH/INSERTION PHASE WILL BE TERMINATED.</p> <p><u>TLC &amp; TEC</u></p> <p>WATER EVAPORATION WILL BE LIMITED TO COMPONENT TESTING.</p> <p><u>POWERED DESCENT</u></p> <p>THERE ARE NO CSM ENVIRONMENTAL CONTROL SYSTEMS FAILURES FOR WHICH POWERED DESCENT WILL BE TERMINATED.</p> <p><u>ALL PHASES</u></p> <p>A. BACKUP SYSTEMS AND BACKUP COMPONENTS WILL NORMALLY BE USED FOR THE MOST RAPID PRACTICAL RETURN TO EARTH, NOT FOR MISSION CONTINUATION.</p> <p>B. LM SYSTEMS WILL BE USED AS REQUIRED FOR CSM SYSTEMS BACKUP. IF CSM SYSTEMS REQUIRE LM BACKUP, THE DESCENT STAGE WILL BE RETAINED WHERE POSSIBLE.</p> <p>C. TO CONTINUE, WATER QUANTITY PREDICTIONS MUST REFLECT ADEQUATE QUANTITIES TO MEET NORMAL MISSION REQUIREMENTS.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	GENERAL	10-1	Tape 33.1

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	ITEM							
	10-2	<p><u>DEFINITIONS</u></p> <p>LOSS OF CABIN INTEGRITY:            CM PRESSURE VESSEL LEAKAGE SUCH THAT CABIN PRESSURE CANNOT BE MAINTAINED GREATER THAN OR EQUAL TO 4.5 PSIA BY CABIN PRESSURE REGULATORS (1.2 LB/HR TOTAL).</p> <p>LOSS OF SUIT/SUIT CIRCUIT INTEGRITY:            • PGA CHECK WITH LEAKAGE GREATER THAN 0.5 PSI/MIN DURING PGA CHECK.            • TOTAL LOOP CHECK WHICH RESULTS IN ECS O<sub>2</sub> FLOW &gt; 0.9 LB/HR AFTER SUIT TEST PRESSURE STABILIZATION DURING SUIT CIRCUIT INTEGRITY CHECK.</p> <p>LOSS OF SUIT CIRCUIT:            INABILITY OF THE SUIT CIRCUIT TO MAINTAIN ADEQUATE CREW COMFORT AND/OR CO<sub>2</sub> REMOVAL WITHOUT USING DIRECT O<sub>2</sub>.</p> <p>LOSS OF O<sub>2</sub> MANIFOLD:            AN O<sub>2</sub> MANIFOLD OR REGULATOR FAILURE WITH WHICH THE SUIT CIRCUIT O<sub>2</sub> DEMANDS CANNOT BE SUPPLIED FOR ENTRY.</p> <p>LOSS OF PRIMARY LOOP COOLING:            LOSS OF ALL FLOW, A LEAK WHICH CANNOT BE ISOLATED, OR COMBINED FAILURES SUCH THAT RADIATORS AND EVAPORATOR PROVIDE NO COOLING.</p> <p>LOSS OF SECONDARY LOOP COOLING:            LOSS OF ALL FLOW, A LEAK WHICH CANNOT BE ISOLATED, OR COMBINED FAILURES SUCH THAT RADIATORS AND EVAPORATOR PROVIDE NO COOLING.</p> <p>LOSS OF COLLANT LOOP RADIATORS:            RADIATOR LEAK, BLOCKAGE OF ALL FLOW THROUGH RADIATORS, OR RADIATOR DEGRADATION SUCH THAT TOTAL LONG-TERM USAGE OF WATER IS MORE THAN IS BEING PRODUCED.</p> <p>LOSS OF ALL COOLING:            LOSS OF PRIMARY AND SECONDARY LOOP COOLING.</p> <p>LOSS OF SURGE TANK AND/OR REPRESS PACK:            SURGE TANK, REPRESS PACK, OR ASSOCIATED ISOLATABLE PLUMBING FAILURES WHICH REQUIRE ISOLATION OF THE SURGE TANK AND/OR REPRESS PACK.</p> <p>RULE NUMBERS 10-3 THROUGH 10-9 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	GENERAL	10-2	Tape 33.2

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	ITEM							
		<u>SYSTEMS MANAGEMENT</u>						
	10-10	<p><u>O<sub>2</sub> SYSTEM</u></p> <p>A. SUIT FLOW RELIEF VALVE WILL REMAIN CLOSED FOR DURATION OF FLIGHT.</p> <p>B. NORMAL CM REPRESSURIZATION WILL UTILIZE THE REPRESS PACK.</p> <p>C. THE REPRESS PACK VALVE WILL BE IN OFF POSITION FOR ALL PHASES EXCEPT LAUNCH, CSM EVA, ENTRY, AND TUNNEL/LM PRESSURIZATION AND RECHARGE.</p> <p>D. THE SUIT CIRCUIT MUST BE PURGED OF ACCUMULATED H<sub>2</sub> ONCE EVERY 6 HOURS FOR 1 MINUTE WHEN ALL CREWMEN ARE SUITED AND THE SUIT CIRCUIT IS ISOLATED.</p> <p>E. THE SURGE TANK AND REPRESS PACK WILL NORMALLY BE RECHARGED SIMULTANEOUSLY.</p> <p>F. CM CABIN PRESSURE WILL NOT BE ALLOWED TO DROP BELOW 4.0 PSIA DURING NORMAL LM PRESSURIZATION EXCEPT DURING TD&amp;E.</p> <p>G. THE CM ECS WILL NORMALLY SUPPLY ALL O<sub>2</sub> FOR CONSUMPTION AND LEAKAGE DURING IVT PHASES.</p> <p>H. THE FLIGHT CREW WILL DON SUITS FOR THE FOLLOWING:</p> <ol style="list-style-type: none"> <li>1. INABILITY TO MAINTAIN CABIN PRESSURE ABOVE 4.5 PSIA</li> <li>2. TD&amp;E</li> <li>3. GLYCOL LEAKS IN COMMAND MODULE</li> <li>4. FIRE, SMOKE, AND/OR CONTAMINATION IN CABIN</li> <li>5. LM JETT</li> <li>6. CSM EVA</li> </ol> <p>I. THE FLIGHT CREW WILL DOFF SUITS (TIME AND CONDITIONS PERMITTING) FOR THE FOLLOWING:</p> <ol style="list-style-type: none"> <li>1. LOSS OF SUIT CIRCUIT</li> <li>2. CONFIRMED LEAK OF GLYCOL IN SUIT CIRCUIT</li> </ol> <p><u>COOLANT MANAGEMENT</u></p> <p>A. FOR SIMULTANEOUS PRIMARY AND SECONDARY LOOP OPERATION, EITHER THE PRIMARY OR SECONDARY LOOP RADIATOR WILL NORMALLY BE ISOLATED.</p> <p>B. GLYCOL RESERVOIR WILL BE ON LINE AND RADIATORS WILL BE BYPASSED FOR LAUNCH.</p> <p>C. INDICATED GLYCOL ACCUMULATOR QUANTITY WILL BE MAINTAINED BETWEEN 30 AND 70 PERCENT.</p> <p>D. SECONDARY COOLANT WILL BE OFF FOR LAUNCH.</p> <p>E. ADDITIONAL POWER LOADS WILL BE ADDED AS REQUIRED IN AN ATTEMPT TO MAINTAIN PRIMARY RADIATOR OUTLET TEMPERATURE GREATER THAN -20 DEG.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	MANAGEMENT	10-3	Tape 57.8

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	ITEM															
	10-10 (CONT)	<p><u>WATER SYSTEM</u></p> <p>A. WASTE WATER WILL BE MANUALLY DUMPED OVERBOARD AS REQUIRED TO MAINTAIN INDICATED QUANTITY LESS THAN 85-90 PERCENT. WASTE WATER WILL NORMALLY BE DUMPED TO 15 PERCENT. HOWEVER, IF WASTE WATER QUANTITY INSTRUMENTATION (CF0009) IS LOST, WASTE WATER WILL BE DUMPED UNTIL POTABLE WATER QUANTITY (CF0010) BEGINS TO DECREASE.</p> <p>B. WATER DUMPS WILL BE MANAGED SO THAT:</p> <ol style="list-style-type: none"> <li>1. AT LOI, THE WASTE TANK WILL CONTAIN GREATER THAN 75 PERCENT</li> <li>2. AT CM-SM SEPARATION, THE POTABLE TANK WILL BE FULL AND THE WASTE TANK WILL BE 90 PERCENT FULL</li> </ol> <p>C. WATER DUMPS AND FUEL CELL PURGES WILL NORMALLY BE SCHEDULED TO OCCUR:</p> <ol style="list-style-type: none"> <li>1. IMMEDIATELY AFTER THE SEXTANT STAR CHECK IN MANEUVER PREPARATION - OR CISLUNAR NAVIGATION - OR NO LATER THAN 1 HOUR BEFORE AN OPTICAL SIGHTING</li> <li>2. BEHIND THE MOON, WITH THE COMPLETION OF THE DUMP OR PURGE BEFORE AOS</li> </ol> <p>D. IN ORDER TO REDUCE TRAJECTORY CALCULATION PERTUBATIONS, WATER DUMPS AND FUEL CELL PURGES WILL NOT BE SCHEDULED:</p> <ol style="list-style-type: none"> <li>1. TEN HOURS BEFORE MCC-4 UNTIL AFTER LOI</li> <li>2. DURING MSFN TRACKING PERIODS</li> <li>3. TEN HOURS BEFORE MCC-7 UNTIL ENTRY</li> </ol> <p>E. WATER DUMPS, FUEL CELL PURGES, AND URINE DUMPS WILL BE INHIBITED:</p> <ol style="list-style-type: none"> <li>1. THREE HOURS BEFORE AND UNTIL IMMEDIATELY AFTER PAN CAMERA AND MAPPING CAMERA OPERATIONS</li> <li>2. FIFTEEN MIN BEFORE AND UNTIL IMMEDIATELY AFTER FAR UV SPECTROMETER OPERATION (ONLY EFFECTIVE FOR FIRST TWO DAYS AFTER CIRCUMLUNAR ORBIT).</li> <li>3. BEFORE AND UNTIL IMMEDIATELY AFTER IR OPERATION.</li> </ol> <p><u>SYSTEM BACKUP</u></p> <p>LM SYSTEMS WILL BE USED AS REQUIRED FOR CSM SYSTEMS BACKUP. DESCENT AND/OR ASCENT STAGE WILL BE RETAINED IF POSSIBLE.</p> <p>RULE NUMBERS 10-11 THROUGH 10-19 ARE RESERVED.</p>														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 5%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 15%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>CSM ENVIRONMENT CONTROL SYSTEM</td> <td>MANAGEMENT</td> <td>10-4</td> <td style="text-align: right;">Tape 57.9</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	MANAGEMENT	10-4	Tape 57.9
MISSION	REV	DATE	SECTION	GROUP	PAGE											
APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	MANAGEMENT	10-4	Tape 57.9										



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MISSION RULES

SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	10-22	LOSS OF SUIT CIRCUIT, CABIN STABLE AND GREATER THAN 4.5 PSIA	LAUNCH  PRE-PDI  POWERED DESCENT  ALL	A. <u>CONTINUE MISSION</u>  OPEN DIRECT O2 VALVE 45 DEG FROM LAUNCH SETTING  B. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI IF POSSIBLE  C. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY  D. <u>ENTER NEXT BEST PTP</u>  1. DOFF SUITS  2. OPEN WASTE OVERBOARD DRAIN VALVE TO OBTAIN CABIN BLEED FLOW  3. DON FACE MASKS AFTER 1 HR  4. IF VACUUM CLEANER FUNCTIONAL AND TIME PERMITS, USE L10H CANISTER ASSEMBLY SHOWN IN CONTINGENCY CHECKLIST C/2-26(5).	LM SYSTEMS (IF AVAILABLE) WILL BE USED FOR CO2 AND H2O REMOVAL.  A. CORRESPONDS TO 12.6 LB/HR (APPROX 3 CFM/CREWMAN)      D.2. WASTE OVERBOARD BLEED = 1.0 LB O2/HR  3. TIME REQUIRED FOR CM CO2 PARTIAL PRESSURE TO INCREASE TO 7.6 mm HG:  1 CREWMAN - 4 HR 3 CREWMAN - 80 MIN			
	10-23	LOSS OF SURGE TANK OR REPRESS PACK	TEC  ALL	A. NO-GO FOR CSM EVA UNLESS OPS AVAILABLE FOR USE BY CDR AND LMP  B. <u>CONTINUE MISSION</u>	FOR LEAK IN SURGE TANK, ISOLATE SURGE TANK AND PLACE REPRESS PKG VALVE TO FILL.			
	10-24	LOSS OF SURGE TANK AND REPRESS PACK	LAUNCH  ALL    TEC	A. <u>CONTINUE MISSION</u>  B. <u>CONTINUE MISSION</u>  PLAN TO RESTORE ENTRY O2 BY STORING OPS IN CM AT FINAL LM EGRESS.  C. <u>CONTINUE MISSION</u>  DOFF SUITS FOR ENTRY. NO-GO FOR CSM EVA	B. OPS O2 QTY - 4 LB/OPS (TWO OPS AVAILABLE)			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	SUIT/CABIN	10-6	Tape 33.6

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MISSION RULES

SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	10-25	FIRE OR SMOKE IN COMMAND MODULE	LAUNCH  PRE-PDI  POWERED  TEC  ALL	A. <u>ABORT</u>  1. DECOMPRESS CABIN  2. TROUBLESHOOT ELECTRICAL SYSTEM PER FLIGHT CREW CHECKLIST BOOST FIRE PROCEDURES.  B. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI  C. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY  D. <u>NO-GO FOR CSM EVA</u>  E.1. TROUBLESHOOT/COMBAT FIRE PER FLIGHT CREW CHECKLIST EMERGENCY PROCEDURES.  2. ASSESS DAMAGE AND REMOVE POWER FROM AFFECTED SYSTEMS  3. <u>ENTER NEXT BEST PTP</u>  RETAIN LM, IF POSSIBLE.				
	10-26	CONTAMINATION IN CABIN	ALL	CREW MAY ELECT TO DECOMPRESS	IF UNABLE TO CLEAR CONTAMINATION, MISSION MAY BE TERMINATED EARLY.			
	10-27	LOSS OF SUIT INTEGRITY	LAUNCH  ALL  TEC	A. <u>CONTINUE MISSION</u>  B. <u>CONTINUE MISSION</u>  NO-GO FOR UNDOCK  C. <u>NO-GO FOR CSM EVA</u>				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	SUIT/CABIN	10-7	Tape 33.7

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MISSION RULES

SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	10-28	LOSS OF O2 MANIFOLD A. O2 MANIFOLD LEAKS GREATER THAN 4 LB/HR AND CABIN PRESSURE GREATER THAN 4.5 PSIA	LAUNCH  UNDOCKED PRE-PDI POWERED DESCENT/ LUNAR STAY  ALL	A.1. <u>CONTINUE MISSION</u>  2. <u>CONTINUE MISSION</u>   3. <u>ENTER NEXT BEST PTP</u>  (A) VERIFY SURGE TANK AND REPRESS PACK ISOLATED UNTIL ENTRY  (B) RETRIEVE OPS FROM LM, IF DOCKED  (C) NO-GO FRO CSM EVA	LM O2 (IF AVAILABLE) MAY BE USED TO SUPPLE- MENT CSM SUPPLY.   A.3. APPROXIMATELY 5 HOURS ARE REQUIRED TO DEplete CABIN O2 FROM 4.8 TO 3.5 PSIA, WITH 0.456 LB/HR USAGE RATE (CREW + CABIN LEAK + TANK PRESS BLEED).  A.3.(B) CREW OPTION TO USE LM ENVIRONMENT FOR EARTH RETURN IN LIEU OF MANUAL CABIN PRESSURE REGULATION.			
		B. O2 MANIFOLD LEAKS GREATER THAN 4 LB/HR AND CABIN PRESSURE LESS THAN 4.5 PSIA	LAUNCH  ALL	B.1. <u>ABORT ASAP</u>  2. <u>ENTER ASAP</u>  USE OPS IN SUITED MODE FOR ENTRY IF PRACTICAL				
	10-29	LOSS OF ONE MAIN REGULATOR A. FAILED CLOSED	TEC/E0  UNDOCK  ALL	A.1. NO-GO FOR CSM EVA UNLESS OPS AVAILABLE FOR USE BY CDR AND LMP  2. CONSIDERATION WILL BE GIVEN TO UNDOCKING  3. <u>CONTINUE MISSION</u>				
		B. FAILED OPEN	ALL	B. <u>CONTINUE MISSION</u>				
	10-30	BOTH MAIN REGULATORS FAILED CLOSED	LAUNCH  LO  UNDOCKED/ PRE-PDI POWERED DESCENT/ LUNAR STAY  ALL	A. <u>CONTINUE MISSION</u>  B. <u>NO-GO FOR UNDOCKING</u>  C. <u>CONTINUE MISSION</u>  D. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR CSM EVA	LM SYSTEMS (IF AVAILABLE) MAY BE USED IN LIEU OF CSM SYSTEMS.   D. SUIT LOOP PRESSURE WILL DROP FROM 3.75 PSIA TO 2.5 PSIA IN APPROXIMATELY 9 MINUTES.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	SUIT/CABIN	10-8	Tape 34.1

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	10-31	LOSS OF ONE SUIT COMPRESSOR	ALL TEC	A. <u>CONTINUE MISSION</u> B. <u>NO-GO FOR CSM EVA</u>					
	10-32	LOSS OF TWO SUIT COMPRESSORS	LAUNCH  EO  LO ALL	A. <u>CONTINUE MISSION</u> OPEN DIRECT 02 45 DEG FROM LAUNCH SETTING  B. <u>CONTINUE MISSION</u> NO-GO FOR TLI  C. <u>NO-GO FOR UNDOCKING</u>  D. <u>CONTINUE MISSION</u> NO-GO FOR CSM EVA	VACUUM CLEANER MAY BE CONNECTED TO SUIT LOOP BUT WILL NOT PROVIDE SUIT INTEGRITY. CONSIDERATION WILL BE GIVEN TO RETAINING LM.				
		RULE NUMBERS 10-33 THROUGH 10-39 ARE RESERVED.							
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	SUIT/CABIN	10-9	Tape 34.2

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MISSION RULES

SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	10-40	PRIMARY COOLANT LOOP MALFUNCTIONS							
		A. LOSS OF EVAPORATOR	LAUNCH ALL	A.1. <u>CONTINUE MISSION</u> 2. <u>CONTINUE MISSION</u> ACTIVATE SECONDARY COOLANT LOOP WITH RADIATORS IN BYPASS AS REQUIRED TO MAINTAIN PRIMARY EVAPORATOR OUT TEMP LESS THAN 90° F OR AS REQUIRED FOR CREW COMFORT.	A.2.(A) MAINTAIN PRI RAD OUT TEMP GREATER THAN -20° F.  (B) WATER MANAGEMENT MAY DICTATE ACTIVATION AND DEACTIVATION OF SECONDARY LOOP TO MAINTAIN PRIMARY RAD OUT TEMP BETWEEN 45° AND 90° F.				
		B. LOSS OF EITHER RADIATOR PANEL	LAUNCH ALL	B.1. <u>CONTINUE MISSION</u>  2. BASED ON WATER AVAILABLE FOR EVAPORATIVE COOLING THE MISSION WILL BE CONTINUED USING SECONDARY RADIATORS SUPPLEMENTED BY PRIMARY LOOP EVAPORATOR.	B.1. ALTERNATE MISSION MAY BE PERFORMED				
		C. TOTAL LOSS OF LOOP	LAUNCH EO  POWERED DESCENT/ LUNAR STAY  TEC ALL	C.1. <u>CONTINUE MISSION</u> ACTIVATE SECONDARY LOOP 2. <u>CONTINUE MISSION</u> NO-GO FOR TLI. ACTIVATE SECONDARY LOOP 3. <u>CONTINUE MISSION</u> ACTIVATE SECONDARY LOOP. 4. <u>NO-GO FOR CSM EVA</u> 5. BASED ON AMOUNT OF WATER AVAILABLE, CONSIDERATION WILL BE GIVEN TO CONTINUING MISSION ON SECONDARY LOOP.	C.2. ALTERNATE MISSION MAY BE PERFORMED.				
		D. LOSS OF BOTH PRIMARY RADIATOR PANELS	LAUNCH EO ALL	D.1. CONTINUE MISSION ACTIVATE SECONDARY LOOP 2. CONTINUE MISSION NO GO FOR TLI, ACTIVATE SECONDARY LOOP 3. BASED ON AMOUNT OF WATER AVAILABLE CONSIDERATION WILL BE GIVEN TO CONTINUING MISSION ON SECONDARY LOOP.					
	10-41	SECONDARY LOOP MALFUNCTIONS							
		A. LOSS OF EVAPORATOR	ALL	A. <u>CONTINUE MISSION</u>					
		B. LOSS OF RADIATORS	EO	B. <u>CONTINUE MISSION</u>	B. LOOP IS STILL OPERATIONAL IN EVAPORATIVE MODE.				
		C. TOTAL LOSS OF LOOP	ALL	C. <u>CONTINUE MISSION</u>					
	10-42	LOSS OF PRIMARY AND SECONDARY EVAPORATORS	ALL	<u>CONTINUE MISSION</u>					
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	COOLANT	10-10	Tape 11C.5



# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	10-50	LOSS OF ALL OVERBOARD DUMP CAPABILITY	EO TLC  ALL	A.1. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR TLI NO-GO FOR LOI  B. <u>CONTINUE MISSION</u>	1. BLEED O2 FROM WATER TANK THROUGH WASTE MANAGEMENT OVERBOARD DRAIN VALVE INTO CABIN.  2. IF POTABLE AND WASTE TANKS (OR WASTE TANKS ALONE) BECOME FULL, FORCED WATER BOILING WILL BE NECESSARY TO ALLOW FUEL CELL AND/OR CYCLIC ACCUMULATOR OPERATION.  3. CSM FLUID STORAGE BAGS AND LM URINE STORAGE CAPABILITY (IF AVAILABLE) WILL BE USED.			
	10-51	UNCONTROLLABLE HIGH HUMIDITY	LAUNCH PRE-PDI  POWERED DESCENT  TEC ALL	A. <u>CONTINUE MISSION</u> B. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI  C. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY  D. <u>NO-GO FOR CSM EVA</u> E. <u>ENTER NEXT BEST PTP</u>	LM SYSTEMS MAY BE USED FOR HUMIDITY CONTROL.			
	10-52	WASTE WATER TANK LEAK OR LOSS OF WASTE WATER STORAGE CAPABILITY	ALL	<u>CONTINUE MISSION</u>	1. LM SYSTEMS (IF AVAILABLE) MAY BE USED TO SUPPLEMENT CSM.  2. WHEN POTABLE WATER TANK BECOMES FULL, SURPLUS FUEL CELL WATER WILL BE ELIMINATED BY:  (A) TEMPORARY STORAGE IN CSM FLUID BAGS OR DUMPING POTABLE WATER DIRECTLY OVERBOARD USING URINE TRANSFER/WATER GUN HOSES TO ENHANCE TRACKING PERIODS  (B) RELIEVING THROUGH OVERBOARD PRESSURE RELIEF VALVES.  3. LOSS OF SUIT LOOP MAY RESULT.			
	10-53	CONFIRMED LEAK IN POTABLE WATER TANK OR UNABLE TO TRANSFER FUEL CELL WATER TO POTABLE TANK   RULE NUMBERS 10-54 THROUGH 10-59 ARE RESERVED	LAUNCH ALL	A. <u>CONTINUE MISSION</u> B. <u>CONTINUE MISSION</u>	LM SYSTEMS (IF AVAILABLE) MAY BE USED TO SUPPLEMENT CSM.  WATER STORAGE BAG(S) WILL BE USED AS BACKUP WATER TANK.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	WATER AND WASTE MGMT	10-12	Tape 34.5

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MISSION RULES

SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS					
	10-60	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCER	CATEGORY	MSN RULE REFERENCE
		CABIN PRESS	CF0001P	METER	COMMON	1 OF	10-20
		SUIT PRESS	CF0012P	METER	COMMON	3 M	
		TANK BLADDER PRESS	CF0120P	----	----		
		SURGE TANK PRESS	CF0006P	METER	COMMON	1 OF	10-28
		OXYGEN REPRESS PRESS	-----	METER	----	2 M	
		PRIM ACCUM QTY	CF0019Q	METER	COMMON	1 OF	10-40, 10-44
		PRIM PUMP OUT PRESS	CF0016P	METER	COMMON	2 M	
		POTABLE H2O QTY	CF0010Q	METER	COMMON	HD	10-53, 10-52
		WASTE H2O QTY	CF0009Q	METER	COMMON	HD	
		SEC STEAM PRESS	CF0073P	METER	COMMON	HD	10-41
		SEC EVAP OUT TEMP	CF0071T	METER	COMMON	HD	
		SEC ACCUM QTY	CF0072Q	METER	COMMON	HD	
		SEC PUMP OUT PRESS	CF0070P	METER	COMMON	HD	
		PRIM EVAP OUT TEMP	CF0018T	METER	COMMON	HD	
		PRIM STEAM PRESS	CF0034	METER	COMMON	HD	
		ECS O2 FLOW	CF0035R	METER	COMMON	HD	
		O2 MANIFOLD PRESS	CF0036P	----	----	HD	
		SUIT COMP PRESS	CF0015P	METER	COMMON	HD	
		PRIM RAD OUT TEMP	CF0020T	METER	COMMON	HD	
		PRIM EVAP INLET TEMP	CF0181T	----	----	HD	
		STEAM DUCT TEMP	CF0017T	----	----	HD	
		SEC RAD OUT TEMP	SF0263T	METER	----	HD	

MISSION	REV	DATE	SECTION	GROUP	PAGE	
APOLLO 17	FNL	9/1/72	CSM ENVIRONMENT CONTROL SYSTEM	INSTR REQUIREMENTS	10-13	Tape 53.5



# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 11 - CSM CRYOGENICS - CONTINUED

R	ITEM	SYSTEMS MANAGEMENT					
	11-10	<p><u>CRYO MANAGEMENT</u></p> <p>A. NORMALLY, TANK PRESSURES WILL BE MAINTAINED BY USE OF TANK HEATERS IN "AUTO" MODE WITH THE EXCEPTION OF H<sub>2</sub> TANK 3, WHICH WILL UTILIZE FANS.</p> <p>B. MANUAL PRESSURE CONTROL WILL NORMALLY BE USED AS REQUIRED TO MAINTAIN:</p> <ol style="list-style-type: none"> <li>1. TANK PRESSURES GREATER THAN 750 PSIA O<sub>2</sub> AND 200 PSIA FOR H<sub>2</sub>.</li> <li>2. SUFFICIENT QUANTITY IN THE LOWEST TWO TANKS IN EACH SYSTEM TO SUPPORT AN EARTH RETURN FROM ANY POINT WITH AT LEAST AN AVERAGE POWER LEVEL OF 40 AMPS AND AS REQUIRED TO MEET MISSION OBJECTIVES.</li> </ol> <p>C. ONE FUEL CELL MAY BE PURGED OR THE SPACECRAFT ELECTRICAL LOADS MAY BE INCREASED TO PRECLUDE CRYO TANK VENTING.</p> <p>D. H<sub>2</sub> TANKS 1 AND 2 FANS WILL NOT BE OPERATED IN THE AUTO MODE. H<sub>2</sub> TANK 3 FANS MAY BE OPERATED IN THE AUTO MODE.</p> <p>E. O<sub>2</sub> TANK 3 ISOLATION VALVE WILL NORMALLY REMAIN OPEN, BUT IT WILL BE CLOSED IF LOSS OF TANKS 1 OR 2 AFFECTS TANK 3 PRESSURE IN ORDER TO PRESERVE O<sub>2</sub> FOR THE ECS.</p>					
	11-11	<p><u>CRYO GAGING</u></p> <p>A. ONBOARD CRYOGENIC QUANTITY GAGING IS PRIME. ACCURACY IS ±2.65 PERCENT (±8.48 LB O<sub>2</sub>, ±0.72 LB H<sub>2</sub>) PER TANK. INSTANTANEOUS O<sub>2</sub> QUANTITY ACCURACIES MAY BE DEGRADED FROM THESE NUMBERS DUE TO LACK OF TANK FANS.</p> <p>B. MCC CALCULATED QUANTITY USING PRESSURE VERSUS TEMPERATURE IS BACKUP.</p> <p>RULE NUMBERS 11-12 THROUGH 11-19 ARE RESERVED.</p>					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	CSM CRYOGENICS	MANAGEMENT	11-2
							Tape 35.2

NASA - Manned Spacecraft Center

MISSION RULES

SECTION 11 - CSM CRYOGENICS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				SPECIFIC MISSION RULES				
	11-20	LOSS OF ONE O2 TANK	LAUNCH ALL POST DOCK TEC	A. <u>CONTINUE MISSION</u> B. CONSIDERATION WILL BE GIVEN TO CONTINUING THE MISSION AFTER LOSS OF A TANK C. <u>JETTISON LM</u> D. CONSIDERATION WILL BE GIVEN TO PERFORMING CSM EVA IF TANKS 1 AND 2 OR 1 AND 3 REMAIN AND QUANTITY IN 2 OR 3 IS LESS THAN 60 PERCENT	LM, PLSS, AND OPS O2 WILL BE USED AS REQUIRED TO SUPPLEMENT CSM O2.			
	11-21	LOSS OF TWO O2 TANKS AND/OR TWO H2 TANKS	LAUNCH EO POWERED DESCENT ALL	A. <u>CONTINUE MISSION</u> B. <u>CONTINUE MISSION</u> NO-GO FOR TLI C. <u>CONTINUE MISSION</u> NO-GO FOR LUNAR STAY D. <u>ENTER NEXT BEST PTP</u> RETAIN LM IF POSSIBLE				
	11-22	LOSS OF ONE H2 TANK	LAUNCH ALL POST DOCK	A. <u>CONTINUE MISSION</u> B. CONSIDERATION WILL BE GIVEN TO CONTINUING THE MISSION AFTER LOSS OF A TANK C. <u>ENTER NEXT BEST PTP</u> JETTISON LM				
	11-23	LOSS OF THREE O2 TANKS AND/OR THREE H2 TANKS	LAUNCH TLC POWERED DESCENT ALL	A. <u>CONTINUE MISSION</u> ISOLATE SURGE TANK BEFORE 800 PSIA B. <u>ENTER NEXT BEST PTP</u> NO-GO FOR LOI C. <u>CONTINUE MISSION</u> NO-GO FOR LUNAR STAY D. <u>ENTER NEXT BEST PTP</u> RETAIN LM IF POSSIBLE	AUX BATTERY WILL POWER SMJC'S.			
		RULE NUMBERS 11-24 THROUGH 11-49 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM CRYOGENICS	SPECIFIC	11-3	Tape 35.3

NASA - Manned Spacecraft Center

MISSION RULES

SECTION 11 - CSM CRYOGENICS - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS					
	11-50	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MSN RULE REFERENCE
		O2 TANK 1 QTY	SC00320	METER	COMMON	1 OF 3	11-20,21,22
		O2 TANK 2 QTY	SC0033Q	METER	COMMON	MANDATORY	
		O2 TANK 3 QTY	SC0051Q	METER	COMMON		
		O2 TANK 1 TEMP	SC0041T	----	-----	HIGHLY	11-20,21,22
		O2 TANK 2 TEMP	SC0042T	----	-----	DESIRABLE	
		O2 TANK 3 TEMP	SC0055T	----	-----		
		H2 TANK 1 QTY	SC0030Q	METER	COMMON	1 OF 3	11-21,22
		H2 TANK 2 QTY	SC0031Q	METER	COMMON	MANDATORY	
		H2 TANK 3 QTY	SC0050Q	METER	COMMON		
		H2 TANK 1 TEMP	SC0043T	----	-----	HIGHLY	11-21,22
		H2 TANK 2 TEMP	SC0044T	----	-----	DESIRABLE	
		H2 TANK 3 TEMP	SC0054T	----	-----		
		O2 TANK 1 PRESS	SC0037P	METER	COMMON	1 OF 3	11-20,21,22
		O2 TANK 2 PRESS	SC0038P	METER	COMMON	MANDATORY	11-20,21,22
		O2 TANK 3 PRESS	SC0053P	METER	COMMON		
		H2 TANK 1 PRESS	SC0039P	METER	COMMON	1 OF 3	11-21,22
		H2 TANK 2 PRESS	SC0040P	METER	COMMON	MANDATORY	11-21,22
		H2 TANK 3 PRESS	SC0052P	METER	COMMON		
		O2 TANK 2 AND 3 MAN. PRESS	SC0069P	C&W	COMMON	HD	
		O2 TANK 1 HTR TEMP	SC0070T	METER	COMMON	HD	11-23
		O2 TANK 2 HTR TEMP	SC0071T	METER	COMMON	HD	11-23
		O2 TANK 3 HTR TEMP	SC0072T	METER	COMMON	HD	11-23
NOTE: PRESSURE OR QUANTITY MEASUREMENT REQUIRED IN EACH CRYO TANK.							
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	CSM CRYOGENICS	INSTR REQ	11-4
							Tape 53.6

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 12 - CSM ELECTRICAL POWER SYSTEM

R	ITEM															
		<u>GENERAL</u>														
	12-1	<p><u>LAUNCH</u></p> <p>A. LAUNCH WILL BE CONTINUED AS LONG AS SUFFICIENT ENERGY IS AVAILABLE TO PERFORM AN ENTRY INTO AT LEAST PTP 2-1. THERE MUST BE AT LEAST ONE MAIN BUS AND ONE AC BUS (THROUGH MODE I AND II REGIONS) OPERATIONAL TO CONTINUE.</p> <p>B. THE LAUNCH PHASE WILL NOT BE TERMINATED AS LONG AS THREE ENTRY BATTERIES REMAIN TO SUPPLY MAIN BUS LOADS OR ONE ENTRY BATTERY AND ONE SM POWER SOURCE REMAIN.</p>														
	12-2	<p><u>POWERED DESCENT</u></p> <p>THERE ARE NO EPS FAILURES FOR WHICH POWERED DESCENT WILL BE TERMINATED.</p>														
	12-3	<p><u>ALL PHASES</u></p> <p>THE MISSION WILL BE CONTINUED AS LONG AS THE REQUIRED NUMBER OF FUEL CELLS ARE AVAILABLE AND ARE CAPABLE OF SUPPORTING MISSION REQUIREMENTS OF 75 TO 90 AMPS (WITHOUT BATTERY SUPPLEMENT EXCEPT DURING SPS ΔV'S) AND THREE GOOD ENTRY BATTERIES REMAIN.</p>														
	12-4	<p>BATTERY IS CONSIDERED FAILED IF:</p> <p>A. LAUNCH - A BATTERY BUS VOLTAGE IS 0.5 VOLTS LESS THAN THE CORRESPONDING MAIN BUS.</p> <p>B. ORBIT - AN ENTRY BATTERY OUTPUT IS LESS THAN 3 AMPS WHEN CONNECTED TO A MAIN BUS DURING SPS MANEUVERS (NOMINAL TOTAL BATTERY CURRENT FOR SPS MANEUVERS IS <math>20 \pm 2</math> AMPS).</p> <p>C. SUSTAINED BATTERY CHARGER OUTPUT TO AN ENTRY BATTERY IS GREATER THAN 2.0 AMPS AND ALL LOADS REMOVED.</p> <p>D. THE AUX BATTERY CANNOT SUPPORT REQUIRED MAIN BUS LOADS.</p>														
	12-5	<p>AN AC BUS IS CONSIDERED FAILED IF ANY TWO PHASES CANNOT BE MAINTAINED GREATER THAN 95 VOLTS.</p>														
	12-6	<p>AN INVERTER IS CONSIDERED FAILED IF:</p> <p>A. OUTPUT VOLTAGE ON ANY PHASE IS GREATER THAN 130 VAC.</p> <p>B. OUTPUT VOLTAGE ON ANY TWO PHASES IS LESS THAN 95 VAC.</p> <p>C. INVERTER TEMP <math>&gt;190^{\circ}</math> F MAY BE USED PERIODICALLY BASED ON TEMP.</p>														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>CSM ELECTRICAL POWER SYSTEM</td> <td>GENERAL</td> <td>12-1</td> <td style="text-align: right;">Tape 43.1</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	GENERAL	12-1	Tape 43.1
MISSION	REV	DATE	SECTION	GROUP	PAGE											
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# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 12 - CSM ELECTRICAL POWER SYSTEM

R	ITEM						
	12-7	<p>FUEL CELL IS CONSIDERED FAILED FOR MISSION PLANNING IF:</p> <p>A. FUEL CELL CANNOT SUPPLY SUFFICIENT POWER TO MEET ITS OWN PARASITIC LOADS (5 AMPS PLUS INLINE HEATER POWER AS REQUIRED).</p> <p>B. FUEL CELL H<sub>2</sub> LOOP IS CONTAMINATED WITH KOH.</p> <p>C. REGULATED H<sub>2</sub> PRESSURE IS LESS THAN 36.7 PSIA (CORRESPONDS TO N<sub>2</sub> PRESSURE SHIFT DOWN TO 28.2 PSIA FOR CRITICAL OPERATION - LOWER N<sub>2</sub> PRESSURE CAN BE MANAGED BY TURNING OFF H<sub>2</sub>O TANK PRESSURE).</p> <p>D. EITHER THE H<sub>2</sub> OR GLYCOL PUMP HAS FAILED.</p>					
	12-8	<p>TLI MINIMUM PURGE CAPABILITY IS BOTH OXYGEN AND HYDROGEN ON ONE FUEL CELL AND AT LEAST OXYGEN ON ONE OTHER FUEL CELL.</p> <p>RULE NUMBERS 12-9 THROUGH 12-19 ARE RESERVED.</p>					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	GENERAL	12-2
							Tape 31.2

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	ITEM															
		<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 80%;"> <p style="text-align: center; margin: 0;"><u>SYSTEMS MANAGEMENT</u></p> </div>														
	12-20	<p><u>BUS MANAGEMENT</u></p> <p>A. MAIN BUSES WILL NORMALLY BE KEPT ISOLATED. BUT WHEN REQUIRED, ONE AND ONLY ONE FUEL CELL WILL BE TIED TO BOTH MAIN BUSES.</p> <p>B. INVERTERS WILL BE CONFIGURED SUCH THAT MAIN BUS A WILL SUPPLY AC BUS 1 AND MAIN BUS B WILL SUPPLY AC BUS 2.</p> <p>C. MAIN BUS VOLTAGE WILL BE MAINTAINED GREATER THAN 26.5 VDC AND LESS THAN 31 VDC. ONE FUEL CELL MAY BE OPEN CIRCUITED FOR OPTIMUM VOLTAGE AND POWER MANAGEMENT.</p> <p>D. THE BATTERY CHARGER WILL BE USED TO CHECK OUT A SUSPECTED SHORTED BUS (EXCEPT MAIN BUSES) AFTER ALL EQUIPMENT AND POWER SOURCES HAVE BEEN REMOVED FROM BUS.</p> <p>E. MINIMUM MAIN BUS VOLTAGE WILL BE MAINTAINED TO BE COMPATIBLE WITH ONLINE OPERATION EQUIPMENT:</p> <table style="margin-left: 40px; border: none;"> <tr><td>1. SPS</td><td style="text-align: right;">24.5</td></tr> <tr><td>2. PGNS</td><td style="text-align: right;">25.0</td></tr> <tr><td>3. AUTO SM-RCS</td><td style="text-align: right;">22.0</td></tr> <tr><td>4. AUTO CM-RCS</td><td style="text-align: right;">21.0</td></tr> <tr><td>5. DIRECT SM-RCS</td><td style="text-align: right;">21.0</td></tr> <tr><td>6. DIRECT CM-RCS</td><td style="text-align: right;">17.0</td></tr> <tr><td>7. INVERTERS</td><td style="text-align: right;">19.0</td></tr> </table>	1. SPS	24.5	2. PGNS	25.0	3. AUTO SM-RCS	22.0	4. AUTO CM-RCS	21.0	5. DIRECT SM-RCS	21.0	6. DIRECT CM-RCS	17.0	7. INVERTERS	19.0
1. SPS	24.5															
2. PGNS	25.0															
3. AUTO SM-RCS	22.0															
4. AUTO CM-RCS	21.0															
5. DIRECT SM-RCS	21.0															
6. DIRECT CM-RCS	17.0															
7. INVERTERS	19.0															
	12-21	<p><u>BATTERY MANAGEMENT</u></p> <p>A. BATTERIES A AND B WILL BE USED TO SUPPLEMENT MAIN BUS LOADS FROM T-75 SECONDS TO INSERTION.</p> <p>B. BATTERIES A AND B WILL BE USED TO SUPPLEMENT MAIN BUS LOADS FOR SPS MANEUVERS. BATTERY C WILL BE ROTATED TO MAINTAIN BATTERY BALANCE IN THE EVENT THE BATTERY CHARGER FAILS.</p> <p>C. BATTERY CHARGING WILL BE TERMINATED FOR ONE OF THE FOLLOWING, WHICHEVER OCCURS FIRST:</p> <ol style="list-style-type: none"> <li>INTEGRATED AMP-HOURS INTO BATTERY BY CHARGER EQUALS INTEGRATED AMP-HOURS OUT OF BATTERY BY LOADS</li> <li>WHEN BATTERY CHARGER CURRENT DECREASES TO 0.62 AMPS (CORRESPONDS TO 39.8 VDC AT THE BATTERY BUS)</li> </ol> <p>D. THREE BATTERIES WILL BE TIED TO THE MAIN BUSES FOR DEORBIT MANEUVER AND ENTRY.</p> <p>E. BATTERIES ARE CONSIDERED TO HAVE 40 AMP-HR CAPABILITY INFLIGHT AND 45 AMP-HR CAPABILITY FOR POSTLANDING.</p> <p>F. A SINGLE BATTERY THAT CANNOT BE RECHARGED WILL NOT BE USED EXCEPT DURING DEORBIT, ENTRY, AND POSTLANDING.</p> <p>G. BATTERY VENT VALVE WILL REMAIN CLOSED UNLESS MANIFOLD PRESSURE IS GREATER THAN 6 PSIA. VENTING OPERATION WILL BE ALLOWED TO TROUBLESHOOT A SUSPECTED FROZEN DUMP. VENTING WILL BE CONSTRAINED TO HAVE A MINIMUM EFFECT ON SIM DATA.</p> <p>H. THE AUX BATTERY WILL NOT BE USED FOR NORMAL MISSION OPERATIONS.</p>														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">MISSION</th> <th style="width: 5%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 25%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>CSM ELECTRICAL POWER SYSTEM</td> <td>MANAGEMENT</td> <td>12-3</td> <td style="text-align: right;">Tape 31.3</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	MANAGEMENT	12-3	Tape 31.3
MISSION	REV	DATE	SECTION	GROUP	PAGE											
APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	MANAGEMENT	12-3	Tape 31.3										

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	ITEM							
	12-22	<p><u>FUEL CELL MANAGEMENT</u></p> <p>A. FUEL CELL WILL BE "SHUT DOWN" FOR THE FOLLOWING:</p> <ol style="list-style-type: none"> <li>1. SUSTAINED CURRENT OUTPUT LESS THAN 5 AMPS</li> <li>2. FUEL CELL H<sub>2</sub> LOOP IS CONTAMINATED WITH KOH</li> <li>3. REACTANT LEAKAGE JEOPARDIZING MISSION DURATION</li> </ol> <p>B. FUEL CELL MAY BE "OPEN CIRCUITED" FOR THE FOLLOWING:</p> <ol style="list-style-type: none"> <li>1. SKIN TEMP GREATER THAN 475° F.</li> <li>2. TCE TEMP GREATER THAN 225° F.</li> <li>3. FAILURE OF H<sub>2</sub> PUMP OR GLYCOL PUMP</li> <li>4. VOLTAGE MANAGEMENT</li> <li>5. FUEL CELL CANNOT BE PURGED AND TIME TO GO IS GREATER THAN PREDICTED FUEL CELL LIFETIME</li> <li>6. CRYO LEAK ISOLATION</li> </ol> <p>C. FUEL CELL O<sub>2</sub> AND H<sub>2</sub> PURGES WILL NORMALLY BE PERFORMED AT 24 AND 48 HOUR INTERVALS, RESPECTIVELY. HOWEVER, THE INTERVALS WILL BE FLEXIBLE TO COINCIDE WITH WATER DUMPS (REF. MR 10-10, WATER SYSTEM, "C" AND "D").</p> <p>D. ADDITIONAL PURGES WILL BE INITIATED AS OPERATIONAL CONDITIONS DICTATE.</p> <p>E. FUEL CELLS WILL NOT BE PURGED FOR CONFIRMED HIGH PH INDICATION.</p> <p>F. EACH H<sub>2</sub> PURGE WILL NORMALLY BE PRECEDED BY 20 MINUTES OF H<sub>2</sub> VENT HEATER OPERATION FOLLOWED BY 10 MINUTES OF HEATER OPERATION AFTER PURGE COMPLETION.</p> <p>G. FUEL CELL INLINE HEATERS WILL NORMALLY OPERATE IN "AUTO" CONTINUOUSLY.</p> <p>H. REACTANT VALVES MUST REMAIN OPEN AT ALL TIMES WITH THE FOLLOWING EXCEPTIONS:</p> <ol style="list-style-type: none"> <li>1. IF THE FUEL CELL IS DECLARED FAILED, OR</li> <li>2. FOR CRYO LEAK ISOLATION. THE FUEL CELL MUST BE "OPEN CIRCUITED" PRIOR TO REACTANT VALVE CLOSURE. THE REACTANT VALVES MUST BE REOPENED PRIOR TO AUTO INLINE HEATER ACTIVATION TO PRECLUDE FUEL CELL FAILURE.</li> </ol> <p>I. ADDITIONAL POWER LOADS WILL BE ADDED AS REQUIRED TO MAINTAIN FC RAD OUT TEMP GREATER THAN -40°. IF CRYO BUDGET JEOPARDIZED OR RAD OUT TEMPS NOT MAINTAINED GREATER THAN -40°, FC RAD WILL BE PLACED IN EMERGENCY BYPASS.</p> <p>J. ONE FUEL CELL MAY BE PURGED TO PRECLUDE VENTING OF CRYO TANKS OR FOR CRYO PRESSURE MANAGEMENT.</p> <p>K. IF IT BECOMES OPERATIONALLY NECESSARY TO SHUT DOWN OR OPEN-CIRCUIT A FUEL CELL, THEN FUEL CELL 2 WILL BE SELECTED.</p> <p>L. LOSS OF EITHER PUMP IN A FUEL CELL WILL BE CONSIDERED LOSS OF BOTH PUMPS, AND EXTENSIVE H<sub>2</sub> PURGES WILL NORMALLY NOT BE PERFORMED FOR THE PURPOSE OF COOLING AND/OR WATER REMOVAL.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	MANAGEMENT	12-4	Tape 31.4

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	ITEM							
	12-23	<p><u>INVERTER MANAGEMENT</u></p> <p>INVERTERS MAY BE REMOVED FROM LINE FOR ANY OF THE FOLLOWING REASONS:</p> <ul style="list-style-type: none"> <li>A. INVERTER TEMP GREATER THAN 190° F</li> <li>B. SPACECRAFT LOAD MANAGEMENT</li> <li>C. ANY PHASE VOLTAGE OUTSIDE 115 ± 5 VAC</li> </ul> <p>RULE NUMBERS 12-24 THROUGH 12-29 ARE RESERVED</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	MANAGEMENT	12-5	Tape 31.5

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				<u>SPECIFIC MISSION RULES</u>				
	12-30	LOSS OF ONE FUEL CELL (OUTPUT LESS THAN 5 AMPS)	LAUNCH	<p><u>A. CONTINUE MISSION</u></p> <p>IF LOSS IS FC 3, OPEN CIRCUIT AND CONFIGURE FC 2 TO MAIN BUS B ONLY.</p>	<p>BAT C WILL USED TO SUPPLEMENT MAIN BUSES LOADS DURING SPS BURNS TO BACK UP ANY SUBSEQUENT FUEL CELL FAILURES. BAT C MAY BE TIED TO EITHER OR BOTH BUSES.</p>			
			ALL	<p><u>B. CONTINUE MISSION</u></p> <p>1. OPEN CIRCUIT FUEL CELL.</p> <p>2. IF LOSS IS FC 3 CONFIGURE FC 2 TO MAIN BUS B ONLY.</p> <p>3. IF FUEL CELL CANNOT BE RESTORED, PERFORM SHUTDOWN.</p>				
	12-31	LOSS OF TWO FUEL CELLS (OUTPUT LESS THAN 5 AMPS EACH)	LAUNCH	<p><u>A. CONTINUE MISSION</u></p> <p>AFTER 2:00 GET PERFORM</p> <p>1. EDS AUTO/OFF TO OFF</p> <p>2. TIE BAT C TO BOTH MAIN BUSES</p>	<p>LM SYSTEMS MAY BE USED TO SUPPLEMENT CSM POWER.</p> <p>A.2. AUX BATTERY MAY BE USED IN LIEU OF BAT C.</p> <p>E. ONE ENTRY BAT OR AUX MAY BE USED TO SUPPLEMENT REMAINING FC FOR G&amp;N ALIGNMENT PRIOR TO DEORBIT.</p> <p>E.2 REF CREW EMERGENCY POWERDOWN PROCEDURE.</p>			
			POWERED DESCENT	<p><u>B. CONTINUE MISSION</u></p> <p>NO-GO FOR LUNAR STAY</p>				
			POST DOCK	<p><u>C. NO-GO FOR LUNAR STAY</u></p> <p>RETAIN LM IF POSSIBLE</p>				
			TEC	<p><u>D. GO FOR CSM EVA</u></p>				
			ALL	<p><u>E. ENTER NEXT BEST PTP</u></p> <p>1. CONNECT REMAINING FUEL CELL TO BOTH MAIN BUSES.</p> <p>2. PERFORM POWERDOWN TO MAINTAIN MAIN BUS VOLTS GREATER THAN 24.5 VDC.</p>				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	FUEL CELLS	12-6	Tape 31.5

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## MISSION RULES

### SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	12-32	LOSS OF THREE FUEL CELLS (OUTPUT LESS THAN 10 AMPS EACH)	LAUNCH        POWERED DESCENT  ALL	A. <u>CONTINUE MISSION</u>  1. TIE AUX BAT TO MAIN A  2. AFTER 2:00 EDS AUTO/OFF TO OFF. TIE BAT C TO BOTH MAIN BUSES  3. POWER DOWN TO 50 AMPS AND ENTER NEXT BEST PTP WITHIN 5 HRS IF FUEL CELLS CANNOT BE RESTORED  B. <u>CONTINUE MISSION</u> NO-GO FOR LUNAR STAY  C. <u>ENTER NEXT BEST PTP</u>	LM SYSTEMS (IF AVAILABLE) MAY BE USED TO SUPPLEMENT FUEL CELL POWER.  A.1 4.75 HOURS LEFT IN ORBIT BEFORE DEORBIT MANEUVER. TIE AUX BAT TO BOTH MAIN BUSES AFTER INSERTION.				
	12-33	LOSS OF ALL SM POWER PLUS ONE ENTRY BATTERY CURRENT LESS THAN 50 PERCENT OF LOAD ON EITHER REMAINING BATTERY	LAUNCH    EO   POWERED DESCENT  ALL	A. <u>ABORT</u>  B. <u>ENTER NEXT BEST ATP OR PTP</u> PERFORM EMERGENCY POWER DOWN  C. <u>CONTINUE MISSION</u> NO-GO FOR LUNAR STAY  D. <u>ENTER NEXT BEST PTP</u> PERFORM EMERGENCY POWER DOWN	USE LM SYSTEMS IF AVAILABLE. RESERVE ENTRY BATTERIES FOR ENTRY.  A. ASSUMES ALL THREE FUEL CELL CURRENTS LESS THAN OR EQUAL TO 5 AMPS AND BATTERY C TIED TO BOTH MAINS.  B. 2.4 HOURS LEFT IN ORBIT BEFORE SPS IGNITION.				
	12-34	DEGRADED FUEL CELLS (UNABLE TO SUPPORT NORMAL DRIFTING FLIGHT LOADS - SCS AND G&N POWERED DOWN - AND MAINTAIN MN BUS VOLTAGE GREATER THAN 26.5 VDC)	LAUNCH  POWERED DESCENT  ALL	A. <u>CONTINUE MISSION</u>  B. <u>CONTINUE MISSION</u> NO-GO FOR LUNAR STAY  C. <u>ENTER NEXT BEST PTP</u>					
		RULE NUMBERS 12-35 THROUGH 12-39 ARE RESERVED.							
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	FUEL CELLS	12-7	Tape 31.6





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MISSION RULES

SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS		
	12-50	<p>MAIN BUS TIE MOTOR SWITCH FAILURES</p> <p>A. ONE MOTOR SWITCH FAILS OPEN</p> <p>B. ONE OR BOTH MOTOR SW FAILED CLOSED</p>	LAUNCH	<p>A.1. <u>CONTINUE MISSION</u></p> <p>(A) IF MOTOR SW A/C, TIE BAT C TO MAIN BUS A.</p> <p>(B) IF MOTOR SW B/C, TIE BAT C TO MAIN BUS B.</p> <p>2. <u>CONTINUE MISSION</u></p> <p>CLOSE ALTERNATE MOTOR SW AND USE MAIN BUS TIE CB'S AS MOTOR SWITCHES.</p> <p>B. <u>CONTINUE MISSION</u></p> <p>1. IF MOTOR SW A/C, BAT A WILL BE TIED TO MAIN BUS A VIA THE B/C MOTOR SW.</p> <p>2. IF MOTOR SW B/C, BAT B WILL BE TIED TO MAIN BUS B VIA THE A/C MOTOR SW.</p>	<p>A.2. BATTERIES MUST BE CHARGED THROUGH OPEN MOTOR SW. LEAVE BAT RLY CB CLOSED FOR CHARGING.</p> <p>B. IF BOTH MOTOR SWITCHES FAIL CLOSED, BATTERIES CANNOT BE CHARGED.</p> <p>B.1 AND 2, REF CSM SCP A-11.</p>		
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	DC DISTRIBUTION	12-10	Tape 31.9

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MISSION RULES

SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	12-51	A. MAIN BUS A SHORTED GREATER THAN 25 AMPS	LAUNCH	A.1. <u>CONTINUE MISSION</u>  (A) EDS AUTO/OFF - OFF (B) FC 2 TO MAIN B ONLY (C) BAT C TO MAIN B (D) INVERTER 3 TO AC 1, MAIN B (E) POWER DOWN MAIN A (F) TVC GIMBAL DRIVE (P, Y) - 2 (G) GIMBAL MOTOR CB'S CONTROL (YAW 2, PITCH 2) BAT B - OPEN AFTER GIMBAL MOTOR TURN ON				
			PRE-PDI	A.2. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI.				
			POWERED DESCENT	A.3. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY				
			ALL	A.4. <u>ENTER NEXT BEST PTP</u> <u>POWER DOWN MAIN A.</u>				
		B. MAIN BUS B SHORTED GREATER THAN 25 AMPS	LAUNCH	B.1. <u>CONTINUE MISSION</u>  (A) EDS AUTO/OFF - OFF (B) BAT C TO MAIN A (C) INVERTER 3 TO AC 2, MAIN A (D) POWER DOWN MAIN B				
			PRE-PDI	B.2. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI.				
			POWERED DESCENT	B.3. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY				
			ALL	B.4. <u>ENTER NEXT BEST PTP</u> <u>POWER DOWN MAIN B</u>				
		C. MAIN BUS SHORTED GREATER THAN 25 AMPS AND FUEL CELL(S) CANNOT BE DIS- CONNECTED FROM SHORTED BUS	LAUNCH	C.1. <u>ABORT</u>	C.1. FAILURE OF MOTOR SWITCH TO DISCONNECT FROM SHORTED BUS INDICATED BY FC SHORTED BUS T/B GRAY.			
			PRE-PDI	C.2. <u>ENTER NEXT BEST PTP IF MAIN BUS NOT RESTORED.</u> NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI.				
			POWERED DESCENT	C.3. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY				
			ALL	C.4. <u>ENTER NEXT BEST PTP</u>	C.4. IF FUEL CELL FEED CIRCUITRY SHORTED, CLOSE FC REACTANT VALVES.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	DC DISTRIBUTION	12-11	Tape 31.10



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MISSION RULES

SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	12-54	A. LOSS OF BAT RELAY BUS OR ONE BATTERY BUS, (UNABLE TO POWER BUS)  B. LOSS OF ONE MAIN BUS (UNABLE TO POWER BUS)  RULE NUMBERS 12-55 THROUGH 12-59 ARE RESERVED.	LAUNCH PRE-PDI  POWERED DESCENT  ALL  LAUNCH PRE-PDI  POWERED DESCENT  TEC  ALL	A.1. <u>CONTINUE MISSION</u>  2. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI  3. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY  4. <u>ENTER NEXT BEST PTP</u>  B.1. <u>CONTINUE MISSION</u>  2. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. REMAIN LM DESCENT STAGE FOR TEI  3. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY  4. <u>NO-GO FOR CSM EVA</u>  5. <u>ENTER NEXT BEST PTP</u>  RETAIN LM, IF POSSIBLE				
	12-60	LOSS OF TWO INVERTERS	LAUNCH PRE-PDI  POWERED DESCENT  TEC  ALL	A. <u>CONTINUE MISSION</u>  B. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI  C. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY  D. <u>NO-GO FOR CSM EVA</u>  E. <u>ENTER NEXT BEST PTP</u>  RETAIN LM	PLACE REMAINING INVERTER ON BOTH AC BUSES.			
	12-61	LOSS OF ONE AC BUS (TWO PHASES CANNOT BE MAINTAINED GREATER THAN 95 VAC)	LAUNCH PRE-PDI  POWERED DESCENT  ALL	A. <u>CONTINUE MISSION</u>  B. <u>ENTER NEXT BEST PTP</u>  NO-GO FOR PDI. RETAIN LM DESCENT STAGE FOR TEI, IF POSSIBLE  C. <u>CONTINUE MISSION</u>  NO-GO FOR LUNAR STAY  D. <u>ENTER NEXT BEST PTP</u>  RETAIN LM				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	AC DISTRIBUTION	12-13	Tape 32.2

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MISSION RULES

SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	12-62	LOSS OF BOTH AC BUSES	LAUNCH  POWERED DESCENT  ALL	<p><u>A. ABORT MODE I OR MODE II</u></p> <p>1. OPEN DIRECT O2 FOR SUIT VENTILATION</p> <p>2. IF AFTER MODE II, ENTER PTP 2-1</p> <p><u>B. CONTINUE MISSION</u></p> <p><u>C. ENTER NEXT BEST PTP OR ATP</u></p> <p>RETAIN LM. IF SUITED, REMOVE HELMET AND GLOVES. IF TIME PERMITS, REMOVE SUITS. IF CABIN DEPRESSURIZED, USE DIRECT O2 UNTIL CABIN IS REPRESSURIZED</p>	<p>A.2. INITIATE CONTINUOUS FC H2 PURGE FOR COOLING.</p> <p>C. FOR CSM ONLY, ENTER WITHIN 1-1/2 HOURS. INITIATE CONTINUOUS FC H2 PURGE FOR COOLING.</p>				
		RULE NUMBERS 12-63 THROUGH 12-69 ARE RESERVED.							
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	CSM ELECTRICAL POWER SYSTEM	AC DISTRIBUTION	12-14	Tape 32.3

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## MISSION RULES

### SECTION 12 - CSM ELECTRICAL POWER SYSTEM - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS					
	12-70	<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>TRANSDUCERS</u>	<u>CATEGORY</u>	<u>MSN RULE REFERENCE</u>
		AC BUS 1 PHASE A VAC	CC0200V	METER	SEPARATE	HIGHLY DESIRABLE	12-5,6,61
		AC BUS 1 PHASE B VAC	-----	METER	-----	HIGHLY DESIRABLE	
		AC BUS 1 PHASE C VAC	-----	METER	-----	HIGHLY DESIRABLE	
				COMMON METER			
		AC BUS 2 PHASE A VAC	CC0203V	METER	SEPARATE	HIGHLY DESIRABLE	12-5,6,61
		AC BUS 2 PHASE B VAC	-----	METER	-----	HIGHLY DESIRABLE	
		AC BUS 2 PHASE C VAC	-----	METER	-----	HIGHLY DESIRABLE	
		MAIN BUS A VDC	CC0206V	METER	SEPARATE	1 OF 2	12-20C,32,52
		MAIN BUS B VDC	CC0207V	METER	SEPARATE	MANDATORY	12-22
		BAT BUS A VDC	CC0210V	METER	SEPARATE	HIGHLY DESIRABLE	
		BAT BUS B VDC	CC0211V	METER	SEPARATE	HIGHLY DESIRABLE	
		BAT RELAY BUS VDC	CC0232V	METER	SEPARATE	HIGHLY DESIRABLE	
		BAT A CURRENT	CC0222C	METER	COMMON	2 OF 3 MANDATORY	12-4,33,40,41
		BAT B CURRENT	CC0223C	METER	COMMON		
		BAT C CURRENT	CC0224C	METER	COMMON		
		FC 1 CURRENT	SC2113C	METER	COMMON	1 OF 3 MANDATORY	12-7,31,32,33, 22A
		FC 1 O2 FLO	SC2142R	METER	COMMON		
		FC 1 H2 FLO	SC2139R	METER	COMMON		
		FC 2 CURRENT*	SC2114C	METER	COMMON	1 OF 3 MANDATORY	12-7,31,32,33, 22A
		FC 2 O2 FLO	SC2143R	METER	COMMON		
		FC 2 H2 FLO	SC2140R	METER	COMMON		
		FC 3 CURRENT	SC2115C	METER	COMMON	1 OF 3 MANDATORY	12-7,31,32,33, 22A
		FC 3 O2 FLO	SC2144R	METER	COMMON		
		FC 3 H2 FLO	SC2141R	METER	COMMON		
		BAT CHARGER CURRENT	CC0215C	METER	COMMON	HIGHLY DESIRABLE	
		FC 1 SKIN TEMP	SC2084T	METER	COMMON	HIGHLY DESIRABLE	12-22B
		FC 2 SKIN TEMP	SC2085T	METER	COMMON	HIGHLY DESIRABLE	
		FC 3 SKIN TEMP	SC2086T	METER	COMMON	HIGHLY DESIRABLE	
		FC 1 COND TEMP	SC2081T	METER	COMMON	HIGHLY DESIRABLE	12-22B
		FC 2 COND TEMP	SC2082T	METER	COMMON	HIGHLY DESIRABLE	
		FC 3 COND TEMP	SC2083T	METER	COMMON	HIGHLY DESIRABLE	
		FC 1 RAD OUT TEMP	SC2087T	METER	COMMON	HIGHLY DESIRABLE	12-22I
		FC 2 RAD OUT TEMP	SC2088T	METER	COMMON	HIGHLY DESIRABLE	
		FC 3 RAD OUT TEMP	SC2089T	METER	COMMON	HIGHLY DESIRABLE	
		BAT MANIFOLD PRESS	-----	METER	-----	HIGHLY DESIRABLE	
		INV 1 TEMP	CC0175T	MCWS	COMMON	HIGHLY DESIRABLE	
		INV 2 TEMP	CC0176T	MCWS	COMMON	HIGHLY DESIRABLE	
		INV 3 TEMP	CC0177T	MCWS	COMMON	HIGHLY DESIRABLE	
		FC 1 PH	SC2160X	TALKBACK	COMMON	HIGHLY DESIRABLE	12-22E
		FC 2 PH	SC2161X	TALKBACK	COMMON	HIGHLY DESIRABLE	
		FC 3 PH	SC2162X	TALKBACK	COMMON	HIGHLY DESIRABLE	
		AUX BAT (SM BAT)	SC0230V	-----	-----	HIGHLY DESIRABLE	
NOTE: USE BAT C IN LIEU OF BATTERY WITH LOST INST.							
* COMMON SHUNT FOR FC 2 AND AUX BAT CURRENT.							

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## MISSION RULES

### SECTION 13 - DOCKING AND UMBILICAL

R	ITEM							
		<u>GENERAL</u>						
	13-1	THREE GOOD DOCKING RING LATCHES 120 DEG APART ARE REQUIRED FOR AN IVT.						
	13-2	DOCKED SPS OR DPS BURNS REQUIRE AT LEAST NINE GOOD DOCKING RING LATCHES.						
	13-3	MANNED UNDOCKING OPERATIONS WILL BE TERMINATED FOR ANY FAILURE OF A DOCKING RING LATCH TO RELEASE. NO ATTEMPT WILL BE MADE TO DISASSEMBLE A DOCKING RING LATCH.						
	13-4	WITH FAILURE OF THE CSM FORWARD HATCH PRIMARY LOCK/UNLOCK MECHANISM, THE NOMINAL MISSION WILL BE PERFORMED USING THE SECONDARY LOCK/UNLOCK MECHANISM.						
	13-5	LOSS OF VISUAL DOCKING AIDS (COAS AND TARGETS) WILL NOT INHIBIT DOCKING AND UNDOCKING.						
	13-6	IF THE DOCKING PROBE FAILS TO INDICATE EXTENSION OR IF BOTH TALKBACK INDICATORS* ARE BARBER POLE, TD&E WILL BE ATTEMPTED.						
		*NOTE: THE ONLY DOCKING PROBE INSTRUMENTATION CONSISTS OF TWO TALKBACK INDICATORS IN THE CSM						
		RULE NUMBERS 13-7 THROUGH 13-10 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	DOCKING AND UMBILICAL	GENERAL	13-1	Tape 35.5

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## MISSION RULES

### SECTION 13 - DOCKING AND UMBILICAL - CONTINUED

R	ITEM	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 80%;"> <u>MANAGEMENT</u> </div>												
13-11	FOR MISFIRE OF A DOCKING RETRACT SQUIB, THE REMAINING SQUIB IN THE SAME SYSTEM WILL BE USED TO ATTEMPT COMPLETION OF DOCKING. TWO NITROGEN BOTTLES REMAINING ARE NORMALLY REQUIRED TO ALLOW UNDOCKING. HOWEVER, BASED ON THE FAILURE MODE, CONSIDERATION WILL BE GIVEN TO UNDOCKING WITH NO NITROGEN BOTTLE REMAINING.													
13-12	THE CM FORWARD AND LM UPPER HATCH NORMALLY WILL BE INSTALLED FOR ANY TYPE OF MANEUVER OR DOCKING.													
13-13	DURING OPERATIONS WHEN CM/LM DOCKED STATUS IS MAINTAINED BY PROBE PRELOAD ONLY (DOCKING LATCHES COCKED) CM/LM THRUSTER ACTIVITY ABOUT CM/LM X-AXIS IS LIMITED AS FOLLOWS:													
	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><u>TUNNEL PRESSURE, PSIA</u></td> <td style="width: 50%; border: none;"><u>COMBINED CM/LM ACTIVE THRUSTERS</u></td> </tr> <tr> <td style="border: none;">GREATER THAN 1.5 PSIA</td> <td style="border: none;">INHIBIT ALL CSM ROLL AND LM YAW CONTROL</td> </tr> <tr> <td style="border: none;">BETWEEN 0 AND 1.5 PSIA</td> <td style="border: none;">NO MORE THAN 2 ROLL JETTS</td> </tr> <tr> <td style="border: none;">0 PSIA</td> <td style="border: none;">NO MORE THAN 4 ROLL JETTS</td> </tr> </table>	<u>TUNNEL PRESSURE, PSIA</u>	<u>COMBINED CM/LM ACTIVE THRUSTERS</u>	GREATER THAN 1.5 PSIA	INHIBIT ALL CSM ROLL AND LM YAW CONTROL	BETWEEN 0 AND 1.5 PSIA	NO MORE THAN 2 ROLL JETTS	0 PSIA	NO MORE THAN 4 ROLL JETTS					
<u>TUNNEL PRESSURE, PSIA</u>	<u>COMBINED CM/LM ACTIVE THRUSTERS</u>													
GREATER THAN 1.5 PSIA	INHIBIT ALL CSM ROLL AND LM YAW CONTROL													
BETWEEN 0 AND 1.5 PSIA	NO MORE THAN 2 ROLL JETTS													
0 PSIA	NO MORE THAN 4 ROLL JETTS													
13-14	LOW PROBE TEMPERATURE WILL NOT INHIBIT DOCKING ATTEMPTS.													
	RULE NUMBERS 13-15 THROUGH 13-19 ARE RESERVED.													
		MISSION	REV	DATE	SECTION	GROUP	PAGE							
		APOLLO 17	FNL	9/1/72	DOCKING AND UMBILICAL	MANAGEMENT	13-2	Tape 35.6						

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MISSION RULES

SECTION 13 - DOCKING AND UMBILICAL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
				<u>SPECIFIC MISSION RULES</u>					
	13-20	FAILURE TO ACHIEVE OR MAINTAIN POWER TO X-LUNAR BUS LOADS FROM CSM	DOCKED	<u>CONTINUE MISSION</u> A. OPEN CB (11) LTG: ANUN/DOCK/COMPNT EPS: DES ECA  OPEN CB (26) LTG: FLOOD EPS: DES ECA  B. ALTERNATE USE OF BATTERIES 1,2,3, AND 4 UNTIL ACTIVATION	1. ANUN/DOCK/COMPNT CB MUST BE OPENED BEFORE 9 HRS AFTER CSM SEPARATION BECAUSE OF THERMAL CONSTRAINTS OF THE LIGHTING CONTROL ASSEMBLY (LCA).  2. NOMINAL MISSION MAY BE PERFORMED BECAUSE LCA, ECA, AND BATTERY THERMAL CONSTRAINTS WILL NOT BE VIOLATED.  3. OVERCURRENT PROTECTION IS LOST UNTIL A DES ECA CB IS CLOSED.				
	13-21	FAILURE TO ACHIEVE S-IVB/LM SEPARATION OR FAILURE TO MATE LM UMBILICALS (P23 AND P24)	TD&E	<u>PERFORM CSM/LM FINAL SEP</u>	S-IVB/LM SEP CANNOT BE ACHIEVED WITHOUT MATING AT LEAST ONE UMBILICAL.  POWER CAN BE SWITCHED AND MAINTAINED WITH EITHER PLUG.				
	13-22	FAILURE TO ACHIEVE CSM/LM FINAL SEPARATION	DOCKED	<u>MUST PERFORM NORMAL UNDOCKING</u> A. RETRIEVE PROBE AND DROGUE AND INSTALL  B. AFTER UNDOCKING, DEPRESS CSM AND JETTISON PROBE OVERBOARD					
	13-23	FAILURE TO INDICATE DOCKING PROBE EXTEND OR BOTH TALKBACK INDICATORS ARE BARBER POLE	TD&E  UNDOCKED	A. <u>CONTINUE MISSION</u> ATTEMPT TD&E  B. <u>CONTINUE MISSION</u> ATTEMPT DOCKING	DOCKING RING TUNNEL STRUCTURE DAMAGE MAY OCCUR TO THE EXTENT THAT TUNNEL PRESSURE CAN NOT BE MAINTAINED.				
	13-24	CANNOT REMOVE CSM FORWARD HATCH	TD&E  DOCKED	A. <u>PERFORM CSM/LM FINAL SEP</u>  B. <u>PERFORM CSM/LM FINAL SEP</u>  IF LM MANNED, PERFORM EVT TO CSM.					
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	DOCKING AND UMBILICAL	SPECIFIC	13-3	Tape 35.7

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MISSION RULES

SECTION 13 - DOCKING AND UMBILICAL - CONCLUDED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	13-25	CANNOT REMOVE DOCKING PROBE, LM DROGUE, AND/OR LM UPPER HATCH.	DOCKED	<u>CONTINUE MISSION</u> PERFORM EVT IF LM MANNED	SPS AND SM RCS MANEUVERS MAY BE PERFORMED.			
	13-26	FAILURE TO RELEASE CAPTURE LATCHES	DOCKED	<u>REDOCK</u>				
	13-27	PRIMARY FORWARD HATCH LOCK/UNLOCK MECHANISM INOPERATIVE	ALL	<u>CONTINUE MISSION</u>				
	13-28	FAILURE TO LOCK CSM FORWARD HATCH	TD&E DOCKED	<u>CONTINUE MISSION</u> ENTER IN SUITS	REF SCP A15 I.A: ASSUMES HATCH CAN BE SEALED AND SECURED WITH CABIN PRESSURE.			
	13-29	FAILURE TO REINSTALL PROBE AND/OR DROGUE OR FAILURE TO CLOSE LM UPPER HATCH	DOCKED	<u>NO UNDOCKING</u>				
	13-30	LOSS OF PRIMARY AND SECONDARY DOCKING SYSTEM	ALL	<u>CONTINUE MISSION</u>				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	DOCKING AND UMBILICAL	SPECIFIC	13-4	Tape 35.8

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## MISSION RULES

### SECTION 14 - CSM SEQUENTIAL

R	ITEM							
		<u>GENERAL</u>						
	14-1	<p><u>LAUNCH</u></p> <p>THERE ARE NO SEQUENTIAL MALFUNCTIONS FOR WHICH LAUNCH WILL BE TERMINATED.</p>						
	14-2	<p>IF AN ENTRY BATTERY IS LOST, THE EDS WILL BE FLOWN OPEN LOOP.</p>						
	14-3	<p><u>ALL MISSION PHASES (EXCEPT LUNAR ORBIT)</u></p> <p>TO CONTINUE THE MISSION, BOTH PYRO BUSES AND BOTH LOGIC BUSES ARE REQUIRED.</p>						
	14-4	<p><u>POWERED DESCENT</u></p> <p>THERE ARE NO CSM SEQUENTIAL SYSTEM FAILURES FOR WHICH POWERED DESCENT WILL BE TERMINATED.</p>						
	14-5	<p>SEQUENTIAL LOGIC BUS IS CONSIDERED FAILED IF:</p> <p>A. VOLTAGE IS LESS THAN 22 VDC AND UNABLE TO ACTIVATE RCS ENABLE AND/OR SLA SEP RELAYS (CD0170X AND/OR CD0123X SYSTEM A, CD0171X AND/OR CD0124X SYSTEM B).</p> <p>B. LOGIC BUS SHORTED GREATER THAN 10 AMPS.</p>						
	14-6	<p>PYRO BUS IS CONSIDERED FAILED IF:</p> <p>A. SHORTED GREATER THAN 10 AMPS</p> <p>B. FAILURE TO PERFORM ANY SEQUENTIAL FUNCTION WITH SUSPECTED FAILED PYRO SYSTEM</p> <p>RULE NUMBERS 14-7 THROUGH 14-9 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM SEQUENTIAL	GENERAL	14-1	
								Tape 36.1

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MISSION RULES

SECTION 14 - CSM SEQUENTIAL - CONTINUED

R	ITEM						
	14-10	<p style="text-align: center;"><u>MANAGEMENT</u></p> <p>ARMING OF THE SEQUENTIAL SYSTEM WILL BE PERFORMED WHILE IN CONTACT WITH A GROUND TELEMETRY SITE. THE FLIGHT CREW WILL ARM THE LOGIC BUSES AND STAND BY FOR A GO FROM THE GROUND TO PROCEED WITH ARMING THE PYRO BUSES.</p> <p>RULE NUMBERS 14-11 THROUGH 14-19 ARE RESERVED.</p>					
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
-	APOLLO 17	FNL	9/1/72	CSM SEQUENTIAL	MANAGEMENT	14-2	Tape 36.2



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MISSION RULES

SECTION 14 - CSM SEQUENTIAL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	14-23	LET JETTISON MOTOR DOES NOT FIRE	LAUNCH	<p><u>CONTINUE MISSION</u></p> <p>ATTEMPT JETTISON PER CREW CHECKLIST EMERGENCY PROCEDURE</p>				
	14-24	SMJC ACTIVATES PREMATURELY	EO TLC  ALL	<p>CONTINUE MISSION IF SOURCE OF ACTIVATION CAN BE DETERMINED AND ISOLATED.</p> <p>ENTER NEXT BEST PTP IF SOURCE OF ACTIVATION CAN NOT BE ISOLATED</p> <p><u>CONTINUE MISSION</u></p>				
	14-25	ACTIVATED CM RCS PRESS LOGIC RELAYS	ALL	<p><u>CONTINUE MISSION</u></p> <p>A. PRIOR TO CM RCS PRESS: DO NOT ARM RESPECTIVE PYRO BUS</p> <p>(FOR BOTH INDICATIONS PERFORM SLA SEP WITH SECS ARM CB'S OPEN.)</p> <p>B. AT CM RCS PRESS: ARM RESPECTIVE PYRO BUS</p>	CD0173X AND/OR CD0174X			
	14-26	ACTIVATED SLA DEPLOY LOGIC RELAYS	ALL	<p><u>CONTINUE MISSION</u></p> <p>A. PRIOR TO SLA SEP: DO NOT ARM RESPECTIVE PYRO BUS</p> <p>B. FOR SLA SEP: ARM RESPECTIVE PYRO BUS FIRST</p>	CD0123X AND/OR CD0124X			
	14-27	UNABLE TO PERFORM SLA SEPARATION	TLC	<p><u>ENTER NEXT BEST PTP</u></p>				
	14-28	ACTIVATED APEX JETTISON LOGIC RELAYS	LUNAR ORBIT/ LUNAR STAY  ALL	<p>A. <u>CONTINUE MISSION</u></p> <p>DO NOT ARM PYRO BUSES UNTIL MALFUNCTION HAS BEEN ISOLATED</p> <p>B. <u>ENTER NEXT BEST PTP</u></p> <p>DO NOT ARM PYRO BUSES UNTIL MALFUNCTION HAS BEEN ISOLATED</p>	DETECTED AT SECS POWER UP (CD0230X AND CD023X)			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM SEQUENTIAL	SPECIFIC	14-4	Tape 36.4



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## MISSION RULES

SECTION 14 - CSM SEQUENTIAL - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS						
	14-50	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MSN RULE REFERENCE	
		PYRO BUS A VOLTS	CD0005V	-----	----	1 OF	14-21	
		PYRO BUS B VOLTS	CD0006V	-----	----	2 M	14-21	
		SEQ LOGIC BUS A VOLTS	CD0200V	-----	----	HD	14-20	
		SEQ LOGIC BUS B VOLTS	CD0201V	-----	----	HD	14-20	
		APEX JET A	CD0230X	-----	----	HD	14-29	
		APEX JET B	CD0231X	-----	----	HD	14-29	
		DROGUE DEPLOY A	CE0001X	-----	----	HD	14-30	
		DROGUE DEPLOY B	CE0002X	-----	----	HD	14-30	
		PILOT CHUTE DEPLOY A	CE0003X	-----	----	HD	14-31	
		PILOT CHUTE DEPLOY B	CE0004X	-----	----	HD	14-31	
		SLA SEP RELAY A	CD0123X	-----	----	HD	14-26	
		RCS/SCS ACTIVATE A	CD0170X	-----	----	HD	-----	
		SLA SEP RELAY B	CD0124X	-----	----	HD	14-26	
		RCS/SCS ACTIVATE B	CD0171X	-----	----	HD	-----	
		CM RCS PRESS SIG A	CD0173X	-----	----	HD	14-25	
		CM RCS PRESS SIG B	CD0174X	-----	----	HD	14-25	
		CM-SM SEP RELAY A	CD0023X	-----	----	HD	-----	
		CM-SM SEP RELAY B	CD0024X	-----	----	HD	-----	
		CREW ABORT A	CD0130X	-----	----	HD	-----	
		CREW ABORT B	CD0131X	-----	----	HD	-----	
		EDS ABORT VOTE 1	CD0132X	-----	----	HD	14-22	
		EDS ABORT VOTE 2	CD0133X	-----	----	HD	14-22	
		EDS ABORT VOTE 3	CD0134X	-----	----	HD	14-22	
		EDS ABORT A	CD0135X	-----	----	HD	-----	
		EDS ABORT B	CD0136X	-----	----	HD	-----	
		MAIN CHUTE DISC A	CE0321X	-----	----	HD	-----	
		MAIN CHUTE DISC B	CE0322X	-----	----	HD	-----	
		EDS ABORT REQ A	BS0080X	-----	----	HD	-----	
		EDS ABORT REQ B	BS0081X	-----	----	HD	-----	
		DOCKING PROBE TEMP	CS0220T	-----	----	HD	-----	
		CSM-LM LOCK RING	CD1154X	-----	----	HD	13-22	
		SEP RELAY A						
		CSM-LM LOCK RING	CD1155X	-----	----	HD	13-22	
		SEP RELAY B						
		LM CURRENT	CC2962C	METER	COMMON	HD	-----	

	MISSION	REV	DATE	SECTION	GROUP	PAGE	
-	APOLLO 17	FNL	9/1/72	CSM SEQUENTIAL	INSTR REQ	14-6	Tape 36.6



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## MISSION RULES

### SECTION 15 - GUIDANCE AND CONTROL

R	ITEM							
	15-3	<p><u>TRANSLUNAR COAST</u></p> <p>IN ORDER TO CONTINUE THE MISSION PAST THE NEXT BEST PTP, THE GUIDANCE AND CONTROL SYSTEMS MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITIES:</p> <p>A. ATTITUDE CONTROL: DIRECT RCS, AUTO ATT CONTROL AND RATE DAMPING IN EACH AXIS.</p> <p>B. RCS TRANSLATION: X-AXIS VIA AUTO COILS OR DIRECT ULLAGE PUSHBUTTON.</p>						
	15-4	<p><u>LOI</u></p> <p>IN ORDER TO COMMIT TO LOI, THE FOLLOWING MINIMUM CAPABILITIES MUST BE AVAILABLE:</p> <p>A. ATTITUDE CONTROL: DIRECT RCS, AUTO ATT CONTROL AND RATE DAMPING IN EACH AXIS</p> <p>B. TVC: BOTH SERVO LOOPS IN INERTIAL YAW, ONE IN PITCH (IF DPS IS AVAILABLE FOR ABORTS AND FOR TEI), AND TWO SCS TVC CONTROL MODES (ACCEL CMD EXCLUDED).</p> <p>C. DELETED</p> <p>D. SPS: NON-CRITICAL BURN CAPABILITY IS REQUIRED.</p>						
	15-5	<p><u>LUNAR ORBIT</u></p> <p>A. LUNAR ORBIT WILL BE TERMINATED EARLY IF EITHER REDUNDANT ATTITUDE CONTROL OR NON-CRITICAL SPS CAPABILITY IS LOST. REDUNDANT SPS CONTROL IS REQUIRED IF LM DPS IS NOT AVAILABLE FOR TEI.</p> <p>B. IN ORDER TO PERFORM A NON-CRITICAL BURN, THE G&amp;C SYSTEMS MUST BE ABLE TO PROVIDE AN ULLAGE MANEUVER BY EITHER CMC AUTO (RCS DAP), SCS AUTO, OR DIRECT ULLAGE.</p>						
	15-6	<p><u>UNDOCKED</u></p> <p>THE UNDOCKED PHASE WILL BE DELETED OR TERMINATED IF THE G&amp;C SYSTEMS CANNOT PROVIDE REDOCKING OR LM RESCUE CAPABILITY. THE G&amp;C SYSTEMS MUST PROVIDE DIRECT RCS AND TRANSLATION CAPABILITY IN EACH AXIS, AND RATE DAMPING IN TWO AXES FOR LINE-OF-SIGHT CONTROL. IN ADDITION, THE FOLLOWING MINIMUM CAPABILITIES FOR LM RESCUE MUST BE AVAILABLE:</p> <p>A. OPERATIONAL OPTICS, OR VHF SUBSYSTEM AND COAS</p> <p>B. ONE DSKY</p> <p>C. TRANSLATION CAPABILITY IN EACH AXIS</p> <p>D. RATE DAMPING IN TWO AXES</p> <p>E. OPERATIONAL IMU AND CMC</p> <p>F. ONE OPERATIONAL RHC</p> <p>G. ONE OPERATIONAL FDAI</p> <p>H. DIRECT RCS IN ALL THREE AXES</p> <p>I. NON-CRITICAL SPS BURN CAPABILITY</p>						
			MISSION	REV	DATE	SECTION	GROUP	PAGE
			APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	GENERAL	15-2
								Tape 57.10



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## MISSION RULES

### SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

R	ITEM								
		<u>SYSTEMS MANAGEMENT</u>							
	15-10	<u>ATTITUDE CONTROL</u>	<p>CSM IN ACTIVE RCS CONTROL - LM WILL NOT BE IN ACTIVE ATTITUDE HOLD. LM IN ACTIVE RCS CONTROL - CSM WILL NOT BE IN ACTIVE ATTITUDE HOLD. FOR DOCKING ACTIVITIES AFTER OPENING THE APS INTERCONNECT (BOTH VEHICLES IN ACTIVE RCS CONTROL), THE CSM MUST BE IN A TIGHTER DEADBAND THAN THE LM.</p>						
	15-11		<p>PIPA BIAS WILL BE UPDATED WHEN ACTUAL BIAS DIFFERS FROM THE VALUE IN CMC ERASABLE BY <math>\pm 0.003</math> FT/SEC<sup>2</sup>. THE FAILURE LIMIT ON THE CSM ACCELEROMETER IS <math>\pm 0.164</math> FT/SEC<sup>2</sup>. THE FIRST GYRO BIAS DRIFT WILL BE UPDATED IF THE DRIFT IS <math>\pm 1</math> MERU (0.015 DEG/HR). THEREAFTER, <math>\pm 3</math> MERU (<math>\pm 0.045</math> DEG/HR) WILL BE THE UPDATE CRITERIA. THE FAILURE LIMIT ON THE CSM GYRO IS <math>\pm 100</math> MERU (<math>\pm 1.5</math> DEG/HR).</p>						
	15-12	<u><math>\Delta V</math> COUNTER DRIFT</u>	<p>A. FOR SPS BURNS, THE <math>\Delta V</math> COUNTER SHOULD BE APPROPRIATELY BIASED FOR DRIFTS OF GREATER THAN 0.015 FT/SEC<sup>2</sup>.</p> <p>B. FOR RCS BURNS, THE <math>\Delta V</math> COUNTER WILL BE BIASED FOR DRIFTS GREATER THAN OR EQUAL TO 0.01 FT/SEC<sup>2</sup>. SHOULD THE DRIFT BE GREATER THAN 0.1 FT/SEC<sup>2</sup>, THE EMS WILL BE CONSIDERED FAILED.</p>						
	15-13	<u>DAP INITIALIZATION</u>	<p>A. GIMBAL TRIMS: WILL BE UPDATED FOR EVERY SPS MANEUVER BASED ON FINAL TRIM POSITIONS OF THE PREVIOUS MANEUVER AS MONITORED ON TELEMETRY, IF THE PREVIOUS MANEUVER WAS SCS CONTROLLED. IF THE PREVIOUS MANEUVER WAS G&amp;N CONTROLLED, THE CMC STORED VALUES WILL BE USED. TRIMS WILL BE REINITIALIZED FROM THE GROUND AFTER EACH VEHICLE CONFIGURATION CHANGE AND AFTER EACH WEIGHT UPDATE. TRIMS MUST BE UPDATED WHEN GROUND COMPUTED VALUES DIFFER FROM CMC STORED VALUES BY 0.5 DEGREE.</p> <p>B. CSM, LM WEIGHT: SHOULD BE UPDATED WHEN GROUND COMPUTED VALUES DIFFER FROM CMC STORED VALUES BY 1.0 PERCENT. WEIGHTS MUST BE UPDATED WHEN GROUND VALUES DIFFER FROM CMC VALUES BY 10.0 PERCENT.</p>						
	15-14	<u>SPS THRUST CONSTRAINTS</u>	<p>A. ET DECAY WILL BE UPDATED WHEN ACTUAL VALUE DIFFERS FROM LOADED BY <math>\pm 0.05</math> SECONDS.</p> <p>B. EFIMP16 WILL BE UPDATED WHEN ACTUAL VALUE DIFFERS FROM LOADED BY 400 LB THRUST.</p> <p>RULE NUMBERS 15-15 THROUGH 15-19 ARE RESERVED.</p>						
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	SYSTEMS MANAGEMENT	15-4	
									Tape 52.6

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MISSION RULES

SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				SPECIFIC MISSION RULES				
	15-20	LOSS OF EITHER BMAG 1 OR 2 IN EITHER PITCH OR YAW CHANNEL	ALL	<u>CONTINUE MISSION</u>	1. REF MALF PROC: G&C-1, 3, 4, AND 8 SEC-1, 3, 3A, AND 6 2. NO SCS AUTO TVC 3. IF IN YAW CHANNEL, AFTER .05G RSI IS UNABLE IF REMAINING GYRO IS SELECTED FOR RATE. RSI MUST BE REALIGNED, IN ADDITION TO THE ABOVE, FOR YAW FAILURE AFTER .05G.			
	15-21	LOSS OF BOTH BMAG 1 AND 2 IN EITHER PITCH OR YAW CHANNEL	LAUNCH TLC LO DESCENT CSM EVA ALL OTHERS ENTRY	A. <u>CONTINUE MISSION</u> B. <u>NO-GO FOR LOI</u> C. <u>NO-GO FOR UNDOCKING</u> ENTER NEXT BEST PTP IF LM DPS NOT AVAILABLE FOR TEI D. <u>CONTINUE MISSION</u> E. <u>CONTINUE MISSION</u> F. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u> G. <u>CONTINUE MISSION</u>	A. MTVC ACCEL CMD IS ONLY MODE III OR MODE IV SPS CONTROL MODE. C. PLAN DPS TEI F. IN EARTH ORBIT, LOSS OF PITCH CHANNEL RESULTS IN ALL THREE DEORBIT METHODS BEING SUBJECTED TO SINGLE FAILURES IN THE G&N SYSTEM. THE YAW LOSS PRECLUDES HYBRID DEORBIT AND SUBJECTS BOTH REMAINING DEORBIT METHODS TO SINGLE FAILURES IN THE G&N SYSTEM G. RSI AND SCS FDAI ROLL UNUSABLE WITH YAW CHANNEL FAILURES.			
	15-22	LOSS OF ROLL BMAG A. NUMBER ONE B. NUMBER TWO	ALL ALL	A. <u>CONTINUE MISSION</u> B. <u>CONTINUE MISSION</u>	A.1. MANUAL ROLL ATTITUDE CONTROL REQUIRED IN ALL SCS MODES. 2. FOR ENTRY, NO SCS FDAI ROLL. RSI VALID. B.1. USE OF ATT 1/RATE 2 AND LIM CYCLE MAY PROVIDE RATE DAMPED ATTITUDE HOLD WHEN RCS DAP IS NOT USED. GYRO PACKAGE 2 MUST BE POWERED DOWN TO EFFECT ATTITUDE HOLD IF FAILURE IS HARDOVER. 2. SELECTION OF RATE 1 WILL PROVIDE BOTH RSI AND SCS FDAI ROLL FOR ENTRY. RSI MUST BE REALIGNED FOR ROLL FAILURE AFTER .05G.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	SCS	15-5	Tape 37.5

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MISSION RULES

SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	15-23	LOSS OF BOTH ROLL BMAG'S	LAUNCH EO TLC POST RNDZ ALL OTHERS	A. <u>CONTINUE MISSION</u> B.1. <u>NO-GO FOR TLI</u> 2. ENTER NEXT BEST PTP IF SM DEORBIT NOT AVAILABLE C. <u>NO-GO FOR LOI</u> D. ENTER NEXT BEST PTP E. <u>CONTINUE MISSION</u>	C. NO SCS FDAI ROLL OR RSI AVAILABLE FOR ENTRY.				
	15-24	LOSS OF EITHER TVC SERVO LOOP IN EITHER PITCH OR YAW AXIS	LAUNCH/EO TLC LO DESCENT ALL OTHERS	A. <u>CONTINUE MISSION</u> SELECT 1 OR 2 ON TVC GIMBAL DRIVE SWITCH IN APPROPRIATE AXIS B. GO FOR LOI IF REDUNDANCY CAN BE MAINTAINED IN INERTIAL YAW AXIS C. <u>NO-GO FOR UNDOCKING</u> ENTER NEXT BEST PTP IF LM DPS NOT AVAILABLE FOR TEI D. <u>CONTINUE MISSION</u> E. <u>TERMINATE PHASE AND</u> <u>ENTER NEXT BEST PTP</u>	MAINTAIN 20 LBS/QUAD/AXIS FOR HARDOVER RECOVERY FOR UNDOCKED AND TBD LBS/QUAD/AXIS FOR HARDOVER RECOVERY FOR DOCKED SPS MANEUVERS.  C. IN LUNAR ORBIT, PLAN DPS TEI.				
	15-25	LOSS OF BOTH TVC SERVO LOOPS	LAUNCH EO TLC DESCENT ALL OTHERS	A. <u>CONTINUE MISSION</u> B. <u>ENTER NEXT BEST PTP</u> RCS DEORBIT C. <u>NO-GO FOR LOI</u> D. <u>CONTINUE MISSION</u> E. <u>TERMINATE PHASE AND</u> <u>ENTER NEXT BEST PTP</u>	A.1. REF MALF PROC G&C-1, G&N-4, SCS-A1 2. NO MODE III OR IV CAPABILITY. LIMITED LANDING POINT CONTROL IN MODE III OR IV WITH SM-RCS.  E. IN LUNAR ORBIT, DO DPS TEI.				
	15-26	LOSS OF PROPORTIONAL CONTROL FROM: A. EITHER RHC B. BOTH RHC'S	ALL ALL	A. <u>CONTINUE MISSION</u> USE REMAINING RHC B. <u>CONTINUE MISSION</u> USE DIRECT RCS OR ACCEL CMD FOR MANUAL MANEUVERS	B. NO MTVC RATE OR MTVC ACCEL CMD CAPABILITY				
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	SCS	15-6	Tape 65.3

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MISSION RULES

SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	15-27	LOSS OF DIRECT RCS CONTROL FROM: A. EITHER RHC, ANY OR ALL AXES B. BOTH RHC'S, SAME AXIS C. BOTH RHC'S, TWO AXES	ALL LAUNCH DESCENT CSM EVA ALL OTHERS LUNAR STAY CSM/EVA	A. <u>CONTINUE MISSION</u> B.1. <u>CONTINUE MISSION</u> 2. <u>CONTINUE MISSION</u> 3. <u>CONTINUE MISSION</u> 4. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u> C.1. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u> 2. <u>CONTINUE MISSION</u>	REF MALF PROC SCS 5  B.5. FAILURE VIOLATES DIRECT RCS REQUIREMENT.			
	15-28	COMPLETE LOSS OF AUTO ATTITUDE CONTROL IN PITCH AND YAW CHANNELS A. CONTROL IS REGAINED BY OPENING EMS CB'S B. CONTROL IS REGAINED BY PLACING S/C CONTROL SWITCH TO CMC. C. CONTROL IS NOT REGAINED	ALL ALL DESCENT CSM/EVA ALL OTHERS	A. <u>CONTINUE MISSION</u> AFTER SM JETTISON EMS MAY BE REENABLED WITHOUT LOSS OF AUTO RCS B. <u>CONTINUE MISSION</u> C.1. <u>CONTINUE MISSION</u> 2. <u>CONTINUE MISSION</u> 3. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u> USE DIRECT ULLAGE AND DIRECT RCS.	REF MALF PROC SCS 1 SUSPECTED FAILURE WOULD BE AUTO INHIBIT CIRCUITRY.  B. NO SCS ATTITUDE CONTROL  C.3. FAILURE VIOLATES RATE DAMPING REQUIREMENTS.			
	15-29	LOSS OF FLIGHT DIRECTOR ATTITUDE INDICATORS A. ONE B. BOTH	ALL LAUNCH TLC DESCENT LUNAR STAY CSM EVA ALL OTHERS	A. <u>CONTINUE MISSION</u> B. 1. <u>CONTINUE MISSION</u> 2. <u>NO-GO FOR LOI</u> 3. <u>CONTINUE MISSION</u> 4. <u>CONTINUE MISSION</u> 5. <u>CONTINUE MISSION</u> 6. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u>	REF MALF PROC G&C-1,2,3,4,5, AND 6  B.5. IN LUNAR ORBIT, DO DPS TEI.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	SCS	15-7	Tape 65.4

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MISSION RULES

SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	15-30	LOSS OF AC1 PHASE A	<p>LAUNCH</p> <p>TLC</p> <p>DESCENT</p> <p>CSM EVA</p> <p>ALL OTHERS</p>	<p>A. <u>CONTINUE MISSION</u></p> <p>B. <u>NO-GO FOR LOI</u></p> <p>C. <u>CONTINUE MISSION</u></p> <p>D. <u>CONTINUE MISSION</u></p> <p>E. <u>TERMINATE PHASE AND</u> <u>ENTER NEXT BEST PTP</u></p>	<p>1. LOSS OF AC1 PHASE A RESULTS IN THE LOSS OF:</p> <p>(A) REDUNDANT SERVO LOOP POWER. BOTH SERVO LOOPS MUST BE POWERED BY THE SAME BUS.</p> <p>(B) PROPORTIONAL ATTITUDE CONTROL FROM BOTH RHC'S. ALL PROPORTIONAL CONTROL FROM RHC NO. 1.</p> <p>(C) FDAI NO. 1</p> <p>(D) GYRO ASSEMBLY NO. 1</p> <p>(E) SCS TOTAL ATTITUDE ERROR</p> <p>(F) SCS TOTAL ATTITUDE</p> <p>(G) SCS AUTO TVC CAPABILITY</p> <p>(H) SCS MINIMUM IMPULSE CAPABILITY</p> <p>(I) SCS ATTITUDE CONTROL RATE DAMPING</p> <p>(J) GPI P AND Y DRIVE NO. 1</p> <p>2. IN EARTH ORBIT, LOSS OF AC1 PRECLUDES HYBRID DEORBIT AND SUBJECTS BOTH REMAINING DEORBIT METHODS TO A SINGLE FAILURE (AC2 PHASE A)</p> <p>E. IN LUNAR ORBIT DO DPS TEI.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
-		APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	SCS	15-8	Tape 38.1

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## MISSION RULES

### SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	15-31	LOSS OF AC2 PHASE A			1. LOSS OF AC2 PHASE A RESULTS IN THE LOSS OF: (A) REDUNDANT SERVO LOOP POWER (B) ALL PROPORTIONAL CONTROL (C) FDAI NO. 2 (D) GYRO ASSEMBLY NO. 2 (E) SCS PITCH AND YAW TOTAL ATTITUDE (F) ALL SCS TVC CAPABILITY (AUTO, RATE AND ACCEL CMD) (G) RSI (H) GPI P AND Y DRIVE NO. 2  2. IN EARTH ORBIT, LOSS OF AC2 RESULTS IN ALL THREE DEORBIT METHODS BEING SUBJECTED TO A SINGLE FAILURE (ACT PHASE A).			
			LAUNCH	A. <u>CONTINUE MISSION</u>				
			TLC	B. <u>NO-GO FOR LOI</u>				
			DESCENT	C. <u>CONTINUE MISSION</u>				
			CSM EVA	D. <u>CONTINUE MISSION</u>				
			ALL OTHERS	E. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u>	E. IN LUNAR ORBIT, DO DPS TEI.			
	15-32	LOSS OF ORBIT RATE DISPLAY (ORDEAL) EARTH AND LUNAR	ALL	<u>CONTINUE MISSION</u>	REF MALF PROC G&C-4 AND 5			
	15-33	LOSS OF ENTRY MONITOR SYSTEM	ALL	<u>CONTINUE MISSION</u>	REF MALF PROC EMS-1			
	15-34	GROUND AT EITHER SPS SOL DRIVER OUTPUT AND UNABLE TO REMOVE	ALL	<u>CONTINUE MISSION</u> OPEN SPS PILOT VALVE CB'S	REF MALF PROC G&C-1			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	SCS	15-9	Tape 38.2



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## MISSION RULES

### SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	15-50	LOSS OF COMMAND MODULE COMPUTER	<p>LAUNCH</p> <p>EO</p> <p>TLC</p> <p>LO</p> <p>UNDOCKED</p> <p>DESCENT</p> <p>POST DOCK</p> <p>CSM EVA</p> <p>ENTRY</p> <p>ALL OTHERS</p>	<p>A. <u>CONTINUE MISSION</u></p> <p>B. <u>CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE</u></p> <p>C. <u>CONTINUE MISSION IF LM DPS AVAILABLE</u></p> <p>D. <u>NO-GO FOR UNDOCKING</u></p> <p style="padding-left: 20px;">ENTER NEXT BEST PTP IF LM DPS NOT AVAILABLE FOR TEI</p> <p>E. <u>DOCK</u></p> <p>F. <u>CONTINUE MISSION</u></p> <p>G. <u>RETAIN LM ASCENT STG</u></p> <p>H. <u>CONTINUE MISSION</u></p> <p>I. <u>PERFORM BACKUP ENTRY</u></p> <p>J. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u></p>	<p>REF MALF PROC G&amp;N-5</p> <p>B. VIOLATES HYBRID DEORBIT MINIMUM REQUIREMENTS</p> <p>D. IN LUNAR ORBIT, PLANS DPS TEI</p> <p>E. VIOLATES LM RESCUE MINIMUM REQUIREMENTS</p> <p>G. USE LM FOR COMM B/U</p> <p>J. CONSIDERATION WILL BE GIVEN TO COMPLETING THE LUNAR STAY PHASE</p>			
	15-51	LOSS OF DSKY A. EITHER MDC OR LEB DSKY B. BOTH MDC AND LEB DSKY	<p>ALL</p> <p>LAUNCH</p> <p>EO</p> <p>TLC</p> <p>LO</p> <p>UNDOCKED</p> <p>DESCENT</p> <p>POST DOCK</p> <p>ENTRY</p> <p>ALL OTHERS</p>	<p>A. <u>CONTINUE MISSION</u></p> <p>B.1. <u>CONTINUE MISSION</u></p> <p>B.2. <u>CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE</u></p> <p>3. <u>CONTINUE MISSION IF LM DPS AVAILABLE</u></p> <p>4. <u>NO-GO FOR UNDOCKING</u></p> <p style="padding-left: 20px;">ENTER NEXT BEST PTP IF LM DPS NOT AVAILABLE FOR TEI</p> <p>5. <u>DOCK</u></p> <p>6. <u>CONTINUE MISSION</u></p> <p>7. <u>RETAIN LM ASCENT STG</u></p> <p>8. <u>PERFORM BACKUP ENTRY</u></p> <p>9. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u></p>	<p>REF MALF PROC G&amp;N-5</p> <p>B.2. VIOLATES HYBRID DEORBIT MINIMUM REQUIREMENTS</p> <p>4. PLAN DPS TEI</p> <p>5. VIOLATES LM RESCUE MINIMUM REQUIREMENTS</p> <p>7. USE LM FOR COMM B/U</p> <p>9. CONSIDERATION WILL BE GIVEN TO COMPLETING THE LUNAR STAY PHASE</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	G&N	15-11	Tape 65.7

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MISSION RULES

SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	15-52	LOSS OF INERTIAL SUBSYSTEM	LAUNCH EO TLC LO UNDOCKED DESCENT POST DOCK CSM EVA ENTRY ALL OTHERS	A. <u>CONTINUE MISSION</u> B. CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE C. <u>NO-GO FOR LOI</u> D. <u>ENTER NEXT BEST PTP</u> E. <u>DOCK</u> F. <u>CONTINUE MISSION</u> G. <u>RETAIN LM ASCENT STG</u> H. <u>CONTINUE MISSION</u> I. <u>PERFORM BACKUP ENTRY</u> J. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u>	REF MALF PROC G&N-6  B. VIOLATES HYBRID DEORBIT MINIMUM REQUIREMENTS  D. IN LUNAR ORBIT, DO DPS TEI E. VIOLATES LM RESCUE REQUIREMENTS  G. USE LM G&N TO MONITOR BURNS  J. VIOLATES LM RESCUE MINIMUM REQUIREMENTS				
	15-53	LOSS OF OPTICS SUBSYSTEM	ALL	<u>CONTINUE MISSION</u>  USE BACKUP ALIGNMENT PROCEDURE (COAS)	REF MALF PROC G&N-5				
	15-54	LOSS OF OPTICS SUBSYSTEM COUPLING DATA UNIT DIGITAL-TO-ANALOG CONVERTER	LAUNCH EO TLC LO  UNDOCKED DESCENT CSM EVA ALL OTHERS	A. <u>CONTINUE MISSION</u> B. CONTINUE MISSION C. <u>CONTINUE MISSION</u> D. <u>NO-GO FOR UNDOCKING</u>  ENTER NEXT BEST PTP IF LM DPS NOT AVAILABLE FOR TEI E. <u>DOCK</u> F. <u>CONTINUE MISSION</u> G. <u>CONTINUE MISSION</u> H. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u>	REF MALF PROC G&C-1 CONSTITUTES LOSS OF TVC DAP  D. IN LUNAR ORBIT, PLAN DPS TEI.				
		RULE NUMBERS 15-55 THROUGH 15-59 ARE RESERVED.							
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	GUIDANCE AND CONTROL	G&N	15-12	Tape 65.8

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## MISSION RULES

### SECTION 15 - GUIDANCE AND CONTROL - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS					
	15-60	<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>TRANSDUCERS</u>	<u>CATEGORY</u>	<u>MSN RULE REFERENCE</u>
		CMC DIGITAL DATA	CG0001V	-	-	MANDATORY	15-50
		SPS SOL DRIVER 1	CH3604X	EMS-SPS-ON	SEPARATE	HIGHLY DESIRABLE	15-34
		SPS SOL DRIVER 2	CH3605X	EMS-SPS-ON	SEPARATE	HIGHLY DESIRABLE	15-34
		PITCH GIMBAL POS 1 & 2	CH3517H	GPI	COMMON	1 OF 2 MANDATORY ONBOARD/HD-PCM	15-24,25
		YAW GIMBAL POS 1 & 2	CH3518H	GPI	COMMON	1 OF 2 MANDATORY ONBOARD/HD-PCM	15-24,25
		TM BIAS 2.5 VDC	CG1110V	-	-	HIGHLY DESIRABLE	15-52,53,54
		PIPA TEMP	CG2300T	-	-	HIGHLY DESIRABLE	15-52
		IMU HTR +28 VDC	CH1513X	-	-	HIGHLY DESIRABLE	15-52
		CMC OPERATE +28 VDC	CG1523X	-	-	HIGHLY DESIRABLE	15-50
		OPTX OPERATE +28 VAC	CG1533X	-	-	HIGHLY DESIRABLE	15-54
		IG 1X RSVR OUT SIN	CG2112V	FDAI	COMMON	HIGHLY DESIRABLE	15-52
		IG 1X RSVR OUT COS	CG2113V	FDAI	COMMON	HIGHLY DESIRABLE	15-52
		MG 1X RSVR OUT SIN	CG2142V	FDAI	COMMON	HIGHLY DESIRABLE	15-52
		MG 1X RSVR OUT COS	CG2143V	FDAI	COMMON	HIGHLY DESIRABLE	15-52
		OG 1X RSVR OUT SIN	CG2172V	FDAI	COMMON	HIGHLY DESIRABLE	15-52
		OG 1X RSVR OUT COS	CG2173V	FDAI	COMMON	HIGHLY DESIRABLE	15-52
		SHAFT CDU DAC OUT	CG3721V	-	-	HIGHLY DESIRABLE	15-54
		TRUNNION CDU DAC OUT	CG3722V	-	-	HIGHLY DESIRABLE	15-54
		CMC WARNING	CG5040X	C&W	COMMON	HIGHLY DESIRABLE	15-50
		PITCH ATT ERROR	CH3500H	FDAI	COMMON	HIGHLY DESIRABLE	15-20,21,22,23
		YAW ATT ERROR	CH3501H	FDAI	COMMON	HIGHLY DESIRABLE	15-20,21,22,23
		ROLL ATT ERROR	CH3502H	FDAI	COMMON	HIGHLY DESIRABLE	15-20,21,22,23
		SCS PITCH BODY RATE	CH3503R	FDAI	COMMON	HIGHLY DESIRABLE	15-20,21,22,23
		SCS YAW BODY RATE	CH3504R	FDAI	COMMON	HIGHLY DESIRABLE	15-20,21,22,23
		SCS ROLL BODY RATE	CH3505R	FDAI	COMMON	HIGHLY DESIRABLE	15-20,21,22,23
		SCS TVC PITCH AUTO CMD	CH3582V	-	-	HIGHLY DESIRABLE	15-24,25
		SCS TVC YAW AUTO CMD	CH3583V	-	-	HIGHLY DESIRABLE	15-24,25
		MTVC PITCH CMD	CH3585H	-	-	HIGHLY DESIRABLE	15-24,25
		MTVC YAW CMD	CH3586H	-	-	HIGHLY DESIRABLE	15-24,25
		FDAI ERROR 5, RATE 5	CH3592X	-	-	HIGHLY DESIRABLE	15-20,21,22,23
		FDAI ERROR 50/15, RATE 50/10	CH3593X	-	-	HIGHLY DESIRABLE	15-20,21,22,23
		PITCH DIFF CLUTCH CUR	CH3666C	-	-	HIGHLY DESIRABLE	15-24,25
		YAW DIFF CLUTCH CUR	CH3667C	-	-	HIGHLY DESIRABLE	15-24,25





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MISSION RULES

SECTION 16 - CSM SPS - CONTINUED

R	ITEM						
	16-9	<p><u>ASCENT PHASE</u></p> <p>LM RESCUE BURNS MAY BE REQUIRED, AND THEY ARE CRITICAL.</p>					
	16-10	<p><u>TRANSEARTH COAST PHASE</u></p> <p>A. CRITICAL BURNS IN THIS PHASE ARE MIDCOURSE CORRECTIONS TO ATTAIN THE PROPER ENTRY CORRIDOR WHICH ARE OUTSIDE SM-SCS CAPABILITY.</p> <p>B. CONSIDERATION WILL BE GIVEN TO PERFORMING THE CSM EVA FOR SPS PROPELLANT LEAKS. SUIT AND CABIN CONTAMINATION BY PROPELLANTS IS THE BASIC PROBLEM AND WILL BE EVALUATED IN REAL TIME.</p>					
	16-11	<p>CONSIDERATION WILL BE GIVEN TO RETAINING THE LM ASCENT STAGE TO GAIN ADDITIONAL <math>\Delta V</math> FOR CERTAIN SPS FAILURES.</p>					
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	CSM SPS	GENERAL	16-3	Tape 58.1

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## MISSION RULES

### SECTION 16 - CSM SPS - CONTINUED

R	ITEM							
		<u>SYSTEMS MANAGEMENT</u>						
	16-12	<u>PROPELLANT GAGING</u>	<p>A. FOR BURNS LESS THAN 25 SECONDS DURATION:</p> <ol style="list-style-type: none"> <li>1. PRIME METHOD: IMU <math>\Delta V</math> OBTAINED</li> <li>2. BACKUP METHOD: FLOW RATE X BURN TIME</li> </ol> <p>B. FOR BURNS GREATER THAN 25 SECONDS DURATION:</p> <ol style="list-style-type: none"> <li>1. PRIME METHOD: IMU <math>\Delta V</math> OBTAINED</li> <li>2. BACKUP METHOD: ONBOARD GAGING SYSTEM</li> </ol>					
	16-13	THE PU VALVE WILL BE USED TO MAINTAIN THE UNBALANCE READING:	<p>A. PRIOR TO CROSSOVER: WITHIN <math>\pm 50</math> LBS OF THE STABLE VALUE OCCURRING APPROXIMATELY 25 SEC AFTER LOI IGNITION.</p> <p>B. AFTER CROSSOVER: WITH <math>\pm 100</math> LBS OF ZERO UNBALANCE.</p>					
	16-14	<u>DUAL BANK VS SINGLE BANK OPERATION</u>	THE SPS WILL ALWAYS BE STARTED USING A SINGLE BANK. HOWEVER, THE OTHER BANK WILL BE OPENED 2 TO 5 SECONDS AFTER IGNITION FOR BURNS PLANNED TO BE LONGER THAN 10 SECONDS.					
	16-15	<u>PROPELLANT MANAGEMENT</u>	DELETED					
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM SPS	MANAGEMENT	16-4	
								Tape 52.7

# NASA - Manned Spacecraft Center

## MISSION RULES

SECTION 16 - CSM SPS - CONTINUED

R	ITEM								
	16-16	<p><u>PROPELLANT FEEDLINE TEMPERATURE MANAGEMENT</u></p> <p>SPS LINE HEATERS WILL BE MANUALLY CYCLED TO MAINTAIN FEEDLINE TEMPERATURES BETWEEN 45° F AND 75° F AND ENGINE VALVE TEMPERATURE ABOVE 45° F.</p> <p>RULE NUMBERS 16-17 THROUGH 16-19 ARE RESERVED.</p>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE		
		APOLLO 17	FNL	9/1/72	CSM SPS	MANAGEMENT	16-5	Tape 39.5	

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MISSION RULES

SECTION 16 - CSM SPS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
				<u>SPECIFIC MISSION RULES</u>					
	16-20	SUSTAINED PRESSURE DECAY IN EITHER THE FUEL OR OXIDIZER TANK (COULD BE HELIUM OR FUEL OR OXIDIZER)	LAUNCH	<u>CONTINUE MISSION</u> PLAN RCS DEORBIT AT NEXT BEST PTP  IF LAND IMPACT IS IMMINENT AFTER ABORTING, REPRESS MANUALLY AND PERFORM BURN TO AVOID LAND.	MALF PROC SPS 1B  REF MR 3-86 MANEUVER TABLE  MANUAL PRESSURIZATION OF THE TANKS SHOULD BE CONSIDERED PRIOR TO ANY REQUIRED SPS BURN.  NOTE:  SUSTAINED PRESSURE DECAY IS DEFINED AS A DECREASE OF AT LEAST 4 PSI, NOT ATTRIBUTABLE TO HELIUM ABSORPTION AND/OR THERMAL EFFECTS.				
			EO	<u>ENTER NEXT BEST PTP</u> RCS DEORBIT					
			TLC	<u>NO-GO FOR LOI-</u> INHIBIT NON-CRITICAL SPS BURNS					
			LO	<u>ENTER NEXT BEST PTP</u> USE DPS IF CAPABILITY EXISTS					
			UNDOCKED	<u>DOCK ASAP</u>	DO NOT STAGE LM				
			DESCENT	<u>ABORT</u>					
			LUNAR STAY	<u>RETURN TO CSM ASAP</u>					
			TEC	<u>CONTINUE MISSION</u> INHIBIT NON-CRITICAL BURNS					
			CSM EVA	<u>CONTINUE MISSION</u>	CONSIDERATION WILL BE GIVEN TO CONTINUING BASED ON AMOUNT OF CONTAMINANTS				
		A. DURING NON-CRITICAL BURN (PRESS LESS THAN OR EQUAL TO 160 PSIA)	ALL	A. <u>TERMINATE BURN</u>					
		B. DURING CRITICAL BURN	ALL	B. <u>CONTINUE BURN</u>					
	16-21	LOSS OF ONE GN2 TANK PRESSURE (LESS THAN 400 PSI)	EO	A. <u>CONTINUE MISSION</u>	MALF PROC SPS 9				
			ALL OTHERS	B.1. VERIFY OPERATION OF SUS-ON SUSPECT BANK  2. IF LOSS CONFIRMED BY ENGINE OPERATION, REF MR 16-22.	TRANSDUCER INDICATION CANNOT BE VERIFIED WITHOUT ENGINE OPERATION.				
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	CSM SPS	SPECIFIC	16-6	Tape 65.10

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## MISSION RULES

### SECTION 16 - CSM SPS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	16-22	LOSS OF ONE BANK OF BALL VALVES	LAUNCH/EO TLC LO UNDOCKED/DESCENT LUNAR STAY	A. <u>CONTINUE MISSION</u> B. <u>CONTINUE MISSION IF DPS AVAILABLE</u> C. <u>NO-GO FOR UNDOCKING</u> ENTER NEXT BEST PTP IF LM DPS NOT AVAILABLE FOR TEI D. N/A E. <u>ENTER NEXT BEST PTP</u>	MALF PROC SPS-9  C. PLAN DPS TEI				
	16-23	LOSS OF BOTH GN2 TANK PRESSURE (LESS THAN 400 PSIA)	LAUNCH EO TLC LO UNDOCKED DESCENT LUNAR STAY TEC	A. <u>CONTINUE MISSION</u> B. <u>ENTER NEXT BEST PTP</u> RCS DEORBIT C. <u>NO-GO FOR LOI</u> D. <u>ENTER NEXT BEST PTP</u> E. <u>DOCK ASAP</u> F. <u>CONTINUE MISSION</u> G. <u>RETURN TO CSM AND PERFORM TEI ASAP</u> H. <u>CONTINUE MISSION</u>	MALF PROC SPS 9 TRANSDUCER INDICATION CANNOT BE VERIFIED WITHOUT ENGINE OPERATION.  D. DO DPS TEI. E. DO NOT STAGE LM				
	16-24	FUEL FEEDLINE AND/OR OXIDIZER FEEDLINE TEMP LESS THAN 40° F AND UNABLE TO INCREASE.	LAUNCH EO TLC LO UNDOCKED DESCENT LUNAR STAY TEC	A. <u>CONTINUE MISSION</u> B. <u>ENTER NEXT BEST PTP</u> RCS DEORBIT C. <u>NO-GO FOR LOI/DOI</u> D. <u>ENTER NEXT BEST PTP</u> E. <u>DOCK ASAP</u> F. <u>CONTINUE MISSION</u> G. <u>RETURN TO CSM ASAP</u> H. <u>CONTINUE MISSION</u>	MALF PROC SPS 11 LIMITATION FOR CRITICAL BURNS IS 25° F.  D. DO DPS TEI. F. DO NOT STAGE LM				
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	CSM SPS	SPECIFIC	16-7	Tape 65.5

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MISSION RULES

SECTION 16 - CSM SPS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
	16-25	ENGINE FLANGE TEMP GOES HIGHER THAN 480° F DURING AN SPS BURN	LAUNCH EO TLC LO ALL ALL	NOT APPLICABLE <u>ENTER NEXT BEST PTP</u> RCS DEORBIT <u>NO-GO FOR LOI/DOI/PDI</u> <u>ENTER NEXT BEST PTP</u> USE DPS IF AVAILABLE A. <u>TERMINATE BURN</u> INHIBIT FURTHER NON-CRITICAL BURNS B. <u>CONTINUE BURN</u> INHIBIT FURTHER NON-CRITICAL BURNS					
		A. DURING NON-CRITICAL BURN							
		B. DURING CRITICAL BURN							
	16-26	THRUST CHAMBER PRESSURE LESS THAN 70 PSI CONFIRMED BY OTHER INSTRUMENTATION	LAUNCH EO TLC LO UNDOCKED ALL OTHERS A. B.	A. NOT APPLICABLE B. <u>ENTER NEXT BEST PTP</u> RCS DEORBIT C. <u>NO-GO FOR LOI/DOI/PDI</u> D. <u>ENTER NEXT BEST PTP</u> E. <u>DOCK</u> F. <u>CONTINUE MISSION</u>  -- <u>TERMINATE BURN</u> INHIBIT FURTHER NON-CRITICAL BURNS  -- <u>CONTINUE BURN</u> INHIBIT FURTHER NON-CRITICAL BURNS	MALF PROC SPS 6  CONFIRMING INSTRUMENTATION INCLUDES ONBOARD PC METER, CREW, DEGRADED THRUST, FU AND OX INTERFACE PRESSURES, F/O VALVE POSITIONS, FU AND OX TANK PRESSURES.  D. DO DPS TEI.  F. DO DPS TEI IF AVAILABLE.				
		A. DURING NON-CRITICAL BURN							
		B. DURING CRITICAL BURN							
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	CSM SPS	SPECIFIC	16-8	Tape 39.8

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MISSION RULES

SECTION 16 - CSM SPS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	16-27	RESERVED						
	16-28	<p>ΔP BETWEEN FUEL AND OX TANK PRESSURES GREATER THAN 20 PSI AND UNABLE TO DECREASE</p> <p>A. DURING NON-CRITICAL BURN</p> <p>B. DURING CRITICAL BURN</p>	<p>LAUNCH</p> <p>EO</p> <p>TLC</p> <p>LO</p> <p>UNDOCKED</p> <p>ALL OTHERS</p>	<p>A. CONTINUE MISSION</p> <p>B. <u>ENTER NEXT BEST PTP</u></p> <p>RCS DEORBIT</p> <p>C. <u>NO-GO FOR LOI</u></p> <p>D. <u>ENTER NEXT BEST PTP</u></p> <p>E. <u>DOCK ASAP</u></p> <p>F. <u>CONTINUE MISSION</u></p> <p>--<u>TERMINATE BURN</u></p> <p>INHIBIT FURTHER NON-CRITICAL BURNS</p> <p>--<u>CONTINUE BURN</u></p> <p>INHIBIT FURTHER NON-CRITICAL BURNS</p>	<p>MALF PROC SPS 1C</p> <p>D. DO DPS TEI.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM SPS	SPECIFIC	16-9	Tape 65.6



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MISSION RULES

SECTION 16 - CSM SPS - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS					
	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MSN RULE REFERENCE	
16-50	OX TK PRESS	SP0003P	METER/C&W	COMMON	1 OF 2 M O/B	16-20,28	
	OX TK PRESS	SP0033P	METER/C&W	COMMON		16-20,28	
	OX SM/ENG INTERFACE P	SP0931P	-	-	HD	16-20,29	
	FU TK PRESS	SP0006P	METER/C&W	COMMON	1 OF 2 M O/B	16-20,28	
	FU TK PRESS	SP0066P	METER/C&W	COMMON		16-20,28	
	FU SM/ENG INTERFACE P	SP0930P	-	-	HD	16-20,28	
	SPS VLV ACT PRESS-PRI	SP0600P	METER	COMMON	M O/B OR PCM	16-21,22	
	SPS VLV ACT PRESS-SEC	SP0601P	METER	COMMON	M O/B OR PCM	16-21,22	
	SPS FU FEEDLINE TEMP	SP0048T	METER	COMMON	HD	16-24	
	SPS OX FEEDLINE TEMP	SP0049T	SYS TEST	COMMON	HD		
	ENG CHAMBER PRESS	SP0661P	METER	COMMON	M O/B	16-26	
	He TK PRESS	SP0001P	METER	SEPARATE	1 OF 2 M	16-29	
	FU/OX VLV 1 POS	SP0022H	DISPLAY	SEPARATE	1 OF 2 M	16-21,26	
	FU/OX VLV 2 POS	SP0023H	DISPLAY	SEPARATE	1 OF 2 M	16-21,26	
	FU/OX VLV 3 POS	SP0024H	DISPLAY	SEPARATE	1 OF 2 M	16-21,26	
	FU/OX VLV 4 POS	SP0025H	DISPLAY	SEPARATE	1 OF 2 M	16-21,26	
	OX TK 1 QTY - TOTAL AUX	SP0655Q	DISPLAY	COMMON	HD	16-10,11,13	
	OX TK 2 QTY	SP0656Q	DISPLAY	COMMON	HD	16-10,11,13	
	FU TK 1 QTY - TOTAL AUX	SP0657Q	DISPLAY	COMMON	HD	16-10,11,13	
	FU TK 2 QTY	SP0658Q	DISPLAY	COMMON	HD	16-10,11,13	
	ENG INJ FLANGE TEMP	SP0062T	-	-	HD	16-25	

MISSION	REV	DATE	SECTION	GROUP	PAGE	
APOLLO 17	FNL	9/1/72	CSM SPS	INSTR REQ	16-11	Tape 58.2



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MISSION RULES

SECTION 17 - CSM SM-RCS - CONTINUED

R	ITEM							
		<u>SYSTEMS MANAGEMENT</u>						
	17-15	<p><u>PROPELLANT GAGING</u></p> <p>A. PRIME METHOD: RTCC EQUATION (5 PERCENT)                      B. BACKUP METHOD: HELIUM PRESSURE/TEMPERATURE (11 PERCENT) (ONBOARD)</p>						
	17-16	<p><u>QUAD PROPELLANT BALANCE</u></p> <p>PROP ISOLATION VALVES WILL NOT BE USED FOR QUAD PROPELLANT BALANCE. PROPELLANT BALANCE WILL BE ACCOMPLISHED BY SELECTING TWO-JET +X AND -X TRANSLATIONS WITH EITHER THE PITCH OR YAW QUAD AND BY CHOOSING SUITABLE JETS FOR ATTITUDE CONTROL. PROPELLANT DIFFERENCES BETWEEN QUADS WILL BE MAINTAINED WITHIN ±50 POUNDS.</p>						
	17-17	<p><u>SECONDARY PROPELLANT FUEL PRESSURE VALVE</u></p> <p>THE RCS SECONDARY FUEL PRESSURIZATION VALVE WILL BE OPENED WHEN THE FUEL MANIFOLD PRESSURE REACHES 150 PSIA OR RTCC SHOWS 115 LBS WILL BE EXCEEDED DURING A TRANSLATION MANEUVER.</p> <p>RULE NUMBERS 17-18 THROUGH 17-19 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM SM-RCS	GENERAL	17-2	Tape 52.8

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MISSION RULES

SECTION 17 - CSM SM-RCS - CONTINUED

RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS				
<u>SPECIFIC MISSION RULES</u>								
17-20	<p>SUSTAINED LEAK IN HELIUM TANK</p> <p>A. ONE OR MORE QUADS</p> <p>B. ONE QUAD (ALL OTHER QUADS NORMAL)</p> <p>C. MORE THAN ONE QUAD</p>	<p>LAUNCH</p> <p>EO</p> <p>ALL OTHERS</p> <p>EO</p> <p>TLC</p> <p>DESCENT</p> <p>ALL OTHERS</p>	<p>A. <u>CONTINUE MISSION</u></p> <p>B.1. <u>NO-GO FOR TLI</u></p> <p>2. <u>CONTINUE MISSION</u></p> <p>C.1. <u>CONTINUE MISSION</u></p> <p>ENTER PRIOR TO LOSS OF HYBRID DEORBIT CAPABILITY</p> <p>2.(A) <u>NO-GO FOR LOI</u></p> <p>(B) <u>CONTINUE MISSION IF SUFFICIENT BLOWDOWN CAPABILITY EXISTS</u></p> <p>3. <u>CONTINUE MISSION</u></p> <p>4. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u></p>	<p>MALF PROC RCS 2</p> <p>QUAD WILL REMAIN USABLE UNTIL He MANIFOLD PRESSURE REACHES 75 PSI.</p> <p>C.4.(A) IN LUNAR ORBIT, DO DPS TEI.</p> <p>(B) RETAIN LM ASCENT STAGE THROUGH TEI DEPENDING UPON LM RCS PROPELLANT REMAINING.</p>				
17-21	<p>SUSTAINED LEAK BELOW He ISOLATION VALVE (COULD BE HELIUM OR FUEL OR OXIDIZER)</p> <p>A. ONE OR MORE QUADS</p> <p>B. ONE QUAD (ALL OTHER QUADS NORMAL)</p> <p>C. MORE THAN ONE QUAD</p>	<p>LAUNCH</p> <p>EO</p> <p>TLC</p> <p>LO</p> <p>UNDOCKED</p> <p>DESCENT</p> <p>LUNAR STAY</p> <p>CSM EVA</p> <p>DESCENT</p> <p>ALL OTHER</p>	<p>A. <u>CONTINUE MISSION</u></p> <p>B.1. <u>NO-GO FOR TLI</u></p> <p>2.(A) <u>CONTINUE MISSION</u></p> <p>3. <u>NO-GO FOR DOI OR UNDOCKING</u></p> <p>4. <u>DOCK ASAP</u></p> <p>5. <u>CONTINUE MISSION</u></p> <p>6. <u>CONTINUE MISSION</u></p> <p>7. <u>CONTINUE MISSION</u></p> <p>C.1. <u>CONTINUE MISSION</u></p> <p>2. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u></p>	<p>MALF PROC RCS 1C</p> <p>QUAD WILL REMAIN USABLE UNTIL He MANIFOLD PRESSURE REACHES 75 PSI.</p> <p>B.3. RETAIN LM ASCENT STAGE FOR TEI DEPENDING ON LM APS/RCS PROPELLANT REMAINING.</p> <p>B.7. CONSIDERATION WILL BE GIVEN TO CONTINUING THE MISSION BASED ON AMOUNT OF CONTAMINANTS</p> <p>C.2. IN LUNAR ORBIT DO DPS TEI.</p>				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM SM-RCS	SPECIFIC	17-3	Tape 47.2

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MISSION RULES

SECTION 17 - CSM SM-RCS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
17-22		PACKAGE TEMP LESS THAN 55° F AND UNABLE TO INCREASE	LAUNCH	NOT APPLICABLE	MALF PROC RCS 1A			
		A. ONE QUAD (ALL OTHER QUADS NORMAL)	ALL	A. <u>CONTINUE MISSION</u>				
		B. MORE THAN ONE QUAD	TLC	B.1. <u>CONTINUE MISSION</u> NO-GO LOI				
			DESCENT	2. <u>CONTINUE MISSION</u>	B.3. (A) IN LUNAR ORBIT DO DPS TEI.			
			ALL OTHER	3. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u>	(B) RETAIN LM ASCENT STAGE FOR TEI DEPENDING UPON LM APS/RCS PROPELLANT.			
17-23		LOSS OF INDIVIDUAL THRUSTERS OR THRUSTER COMBINATIONS AS A RESULT OF CLOGGING, FREEZING, BURNOUT, OR CONTROL SYSTEM MALFUNCTION	LAUNCH	NOT APPLICABLE	CONTROL SYSTEM MALFUNCTION WILL CAUSE LOSS OF AUTO COILS OF THRUSTER ALTHOUGH DIRECT COILS ARE STILL AVAILABLE.			
		A. LOSS OF ANY ROLL THRUSTER	ALL	A. <u>CONTINUE MISSION</u>				
		B. LOSS OF FOLLOWING THRUSTER COMBINATIONS:  TWO PITCH OR TWO YAW ONE PITCH AND ONE YAW  PITCH AND TWO ROLL IN SAME DIRECTION  ONE YAW AND TWO ROLL IN SAME DIRECTION  THREE ROLL IN SAME DIRECTION	EO  TLC  TLC/ UNDOCKED  DESCENT  LUNAR STAY	B.1. CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM RCS DEORBIT CAPABILITY AND ALL AXIS ATTITUDE CONTROL AVAILABLE  2. <u>NO-GO FOR LOI</u>  PLAN TEI FOR NEXT OPPORTUNITY  3. <u>DOCK ASAP</u>  4. <u>CONTINUE MISSION</u>  5. <u>ENTER NEXT BEST PTP</u>	B.4. RETAIN LM ASCENT STAGE FOR TEI IF LOSS OF ALL THRUSTERS IN ONE DIRECTION IN SAME AXIS.			
		C. LOSS OF +X THRUSTERS ON ADJACENT QUADS	EO ALL	C.1. <u>ENTER NEXT BEST PTP</u> 2. <u>INHIBIT NON-CRITICAL SPS BURNS</u>	C. REF SPS RULE 16-27, LACK OF ULLAGE CAPABILITY			
		D. LOSS OF ANY ONE OF C2 AND D2, C3, C4, C1 AND D1, D3, D4	CSM EVA	D. <u>NO-GO/TERMINATE</u>	D. USE LM RCS FOR ATTITUDE CONTROL IF AVAILABLE.			
		RULE 17-24 THROUGH 17-49 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM SM-RCS	SPECIFIC	17-4	Tape 44.6

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## MISSION RULES

SECTION 17 - CSM SM-RCS - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS					
	17-50	<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>TRANSDUCERS</u>	<u>CATEGORY</u>	<u>MSN RULE REFERENCE</u>
		SM He TK A PRESS	SR5001P	METER	COMMON }	1 M	17-20,21
		QTY SM-RCS PROP SYS A	SR5025Q	METER	COMMON }	O/B OR PCM	17-20,21
		SM He TK B PRESS	SR5002P	METER	COMMON }	1 M	17-20,21
		QTY SM-RCS PROP SYS B	SR5026Q	METER	COMMON }	O/B OR PCM	17-20,21
		SM He TK C PRESS	SR5003P	METER	COMMON }	1 M	17-20,21
		QTY SM-RCS PROP SYS C	SR5027Q	METER	COMMON }	O/B OR PCM	17-20,21
		SM He TK D PRESS	SR5004P	METER	COMMON }	1 M	17-20,21
		QTY SM-RCS PROP SYS D	SR5028Q	METER	COMMON }	O/B OR PCM	17-20,21
		SM ENG PKG A TEMP	SR5065T	METER/C&W	COMMON	HD	17-22
		SM ENG PKG B TEMP	SR5066T	METER/C&W	COMMON	HD	17-22
		SM ENG PKG C TEMP	SR5067T	METER/C&W	COMMON	HD	17-22
		SM ENG PKG D TEMP	SR5068T	METER/C&W	COMMON	HD	17-22
		SM He TK A TEMP	SR5013T	METER	COMMON	HD	17-20,21
		SM He TK B TEMP	SR5014T	METER	COMMON	HD	17-20,21
		SM He TK C TEMP	SR5015T	METER	COMMON	HD	17-20,21
		SM He TK D TEMP	SR5016T	METER	COMMON	HD	17-20,21
		SM He MAN A PRESS	SR5729P	---	--	HD	17-20,21
		SM He MAN B PRESS	SR5776P	---	--	HD	17-20,21
		SM He MAN C PRESS	SR5817P	---	--	HD	17-20,21
		SM He MAN D PRESS	SR5830P	---	--	HD	17-20,21
		SM FU MAN A PRESS	SR5737P	METER/C&W	COMMON	HD	17-12,21
		SM FU MAN B PRESS	SR5784P	METER/C&W	COMMON	HD	17-12,21
		SM FU MAN C PRESS	SR5822P	METER/C&W	COMMON	HD	17-12,21
		SM FU MAN D PRESS	SR5823P	METER/C&W	COMMON	HD	17-12,21
		SM OX MAN A PRESS	SR5733P	---	--	HD	17-21
		SM OX MAN B PRESS	SR5780P	---	--	HD	17-21
		SM OX MAN C PRESS	SR5820P	---	--	HD	17-21
		SM OX MAN D PRESS	SR5821P	---	--	HD	17-21

	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	CSM SM-RCS	INSTR REQ	17-5	Tape 58.3

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## MISSION RULES

### SECTION 18 - CSM CM-RCS

R	ITEM															
		<u>GENERAL</u>														
	18-1	<p><u>LAUNCH</u></p> <p>A. A SUSTAINED LEAK IN OR THE LOSS OF HELIUM SUPPLY PRESSURE OR HELIUM MANIFOLD PRESSURE IN ONE CM RCS RING IS NOT CAUSE FOR ABORT SINCE THE REMAINING RING IS CAPABLE OF ABORT OR ENTRY ATTITUDE CONTROL. THIS FAILURE WILL REQUIRE ENTRY INTO NEXT REST PTP SINCE SYSTEMS ARE NO LONGER REDUNDANT.</p> <p>B. A SUSTAINED LEAK IN OR THE LOSS OF HELIUM MANIFOLD PRESSURE IN BOTH CM RCS RINGS PRIOR TO TOWER JETTISON IS JUSTIFICATION FOR A MODE I ABORT. THE HELIUM SUPPLY PRESSURE IS NOT REQUIRED FOR MODE I IF THE SYSTEM CAN BE PRESSURIZED TO NOMINAL PRESSURES, WHICH WOULD PROVIDE SUFFICIENT BLOWDOWN IN EACH RING. AFTER TOWER JETTISON, IT IS NOT CAUSE FOR ABORT SINCE THE ABILITY TO PERFORM A SAFE ENTRY INTO THE ATLANTIC AT THE END OF THE FIRST REV STILL EXISTS BY USING THE CONTINGENCY SM RCS SPINUP PRIOR TO CM/SM SEP. THIS METHOD OF ENTRY IS CONSIDERED OPERATIONALLY PREFERABLE TO PERFORMING AN ABORT AND PRESENTS LESS POTENTIAL HAZARD TO CREW RECOVERY. FURTHERMORE, CM RCS CONTROL IS REQUIRED FOR ABORTS IN THE MODE II AND MODE III REGIONS, AND TO ABORT THE LAUNCH IN THESE REGIONS FOR LOSS OF CM RCS CAPABILITY WOULD PUT THE SPACECRAFT AND CREW INTO AN UNSAFE ENVIRONMENT.</p>														
	18-2	<p><u>LUNAR ORBIT, LUNAR STAY PHASES</u></p> <p>A. LUNAR ORBIT ACTIVITIES WILL BE TERMINATED FOR LOSS OR IMPENDING LOSS OF ONE CM RCS SYSTEM.</p> <p>B. THESE PHASES WILL BE CONTINUED IF THE CM RCS IS ARMED.</p> <p>C. LOSS OF ONE SYSTEM IS CAUSE FOR ENTRY INTO THE NEXT BEST PTP.</p>														
	18-3	<p><u>LM DESCENT PHASE</u></p> <p>THERE ARE NO CM RCS FAILURES THAT ARE CAUSE FOR TERMINATING THE DESCENT PHASE.</p>														
	18-4	<p><u>ALL OTHER PHASES</u></p> <p>A. SUSTAINED LEAK IN OR LOSS OF HELIUM MANIFOLD PRESSURE (COULD BE EITHER FUEL OR OXIDIZER) IN ONE CM RCS RING DELETES THE REDUNDANCY OF THE ENTRY ATTITUDE CONTROL SYSTEM AND REDUCES THE <math>\Delta V</math> AVAILABLE FOR HYBRID DEORBIT. LOSS OF HELIUM SUPPLY PRESSURE OR HELIUM MANIFOLD PRESSURE IN BOTH CM RCS RINGS DELETES ALL ENTRY ATTITUDE CONTROL CAPABILITY REQUIRING CONTINGENCY SM RCS SPINUP PRIOR TO CM/SM SEP. THE LOSS OF ONE OR BOTH CM RCS RINGS IS CAUSE FOR TERMINATING THE PHASE AND MISSION BY ENTRY INTO THE NEXT BEST PTP.</p> <p>B. DELETED</p> <p>C. DELETED</p>														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>CSM CM-RCS</td> <td>GENERAL</td> <td>18-1</td> <td style="text-align: right;">Tape 43A.3</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	CSM CM-RCS	GENERAL	18-1	Tape 43A.3
MISSION	REV	DATE	SECTION	GROUP	PAGE											
APOLLO 17	FNL	9/1/72	CSM CM-RCS	GENERAL	18-1	Tape 43A.3										

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MISSION RULES

SECTION 18 - CSM SM-RCS - CONTINUED

R	ITEM						
	18-5	<p><u>ALL PHASES</u></p> <p>SUSTAINED DECREASE IN (OR LOSS OF) HELIUM TANK PRESSURES IN EITHER RING REQUIRES THAT THE CM RCS BE PRESSURIZED ASAP. 1250 PSI HELIUM TANK PRESSURE IS REQUIRED TO PROVIDE A FULLY PRESSURIZED SYSTEM.</p> <p>RULE NUMBERS 18-6 THROUGH 18-9 ARE RESERVED.</p>					
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	CSM CM-RCS	GENERAL	18-2	Tape 52.9

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MISSION RULES

SECTION 18 - CSM CM-RCS - CONTINUED

R	ITEM							
		<u>SYSTEMS MANAGEMENT</u>						
	18-10	<p><u>THRUSTER TEMP CONTROL</u></p> <p>CM RCS THRUSTERS MAY BE HEATED PRIOR TO ENTRY FOR 20 MINUTES OR UNTIL THE LOWEST INDICATED TEMPERATURE IS 28° F, WHICHEVER COMES FIRST. IF THRUSTER(S) HEATER FUNCTION FAILS, CM RCS IS STILL CONSIDERED OPERATIONAL PENDING RESULTS OF CM RCS CHECKOUT PRIOR TO ENTRY.</p> <p>MALF PROC RCS 5.</p>						
	18-11	<p><u>HELIUM INTERCONNECT</u></p> <p>AS A LAST RESORT, IF THE HELIUM IN ONE RING IS DEPLETED DUE TO A LEAK AND THE PROPELLANT IS DEPLETED IN THE OTHER RING, THE SYSTEMS MAY BE INTERCONNECTED IF THE REMAINING PROPELLANT IS REQUIRED FOR CONTROL. ONCE INTERCONNECTED, THE RINGS CANNOT BE ISOLATED.</p> <p>MALF PROC RCS 4.</p> <p>RULE NUMBERS 18-12 THROUGH 18-19 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM CM-RCS	MANAGEMENT	18-3	Tape 40.8

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MISSION RULES

SECTION 18 - CSM SM-RCS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				SPECIFIC MISSION RULES				
	18-20	SUSTAINED LEAK IN OR COMPLETE LOSS OF HELIUM SUPPLY PRESSURE  ONE OR BOTH RINGS	ALL	CONTINUE MISSION IN SUFFICIENT BLOWDOWN IS AVAILABLE IN EACH RING FOR ENTRY				
	18-21	SUSTAINED LEAK IN OR COMPLETE LOSS OF HELIUM MANIFOLD PRESSURE (COULD BE EITHER FUEL OR OXIDIZER)  A. ONE RING	LAUNCH	A.1. <u>CONTINUE MISSION AND ENTER NEXT BEST PTP</u>	A.3. CONSIDERATION WILL BE GIVEN TO CONTINUING BASED ON AMOUNT OF CONTAMINANTS.			
			DESCENT	2. <u>CONTINUE MISSION</u>				
			EVA	3. <u>CONTINUE MISSION</u>				
			ALL OTHERS	4. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u>				
		B. BOTH RINGS	LAUNCH	B.1. CONTINUE MISSION AND ENTER NEXT BEST PTP UNLESS PRIOR TO TOWER JETTISON. IF PRIOR TO TOWER JETTISON, ABORT.	B.3. CONSIDERATION WILL BE GIVEN TO CONTINUING BASED ON AMOUNT OF CONTAMINANTS.  B.4. CM SPIN-UP REQUIRED PRIOR TO ENTRY.			
			DESCENT	2. <u>CONTINUE MISSION</u>				
			EVA	3. <u>CONTINUE MISSION</u>				
			ALL OTHER	4. <u>TERMINATE PHASE AND ENTER NEXT BEST PTP</u>				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	CSM CM-RCS	SPECIFIC	18-4	Tape 47.4

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MISSION RULES

SECTION 18 - CSM CM-RCS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS		
	18-22	CM RCS IS ARMED FOR ANY REASON  RULE NUMBERS 18-23 THROUGH 18-49 ARE RESERVED.	ALL	<u>CONTINUE MISSION</u>			
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	CSM CM-RCS	SPECIFIC	18-5	Tape 43A.4

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MISSION RULES

SECTION 18 - CSM CM-RCS - CONCLUDED

R	ITEM	<u>INSTRUMENTATION REQUIREMENTS</u>					
	18-50	<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>TRANSDUCERS</u>	<u>CATEGORY</u>	<u>MSN RULE REFERENCE</u>
		CM He TK A PRESS	CRO001P	METER	COMMON	M O/B OR PCM	18-20
		CM He TK B PRESS	CRO002P	METER	COMMON	M O/B OR PCM	18-20
		CM TK A TEMP	CRO003P	METER	COMMON	HD	18-20
		CM TK B TEMP	CRO004P	METER	COMMON	HD	18-20
		CM He MNFLD A PRESS	CRO035P	C&W METER	SEPARATE	1 OF 2 M	18-21
		CM He MNFLD B PRESS	CRO036P	C&W METER	SEPARATE	1 OF 2 M	18-21

	MISSION	REV	DATE	SECTION	GROUP	PAGE	
-	APOLLO 17	FNL	9/1/72	CSM CM-RCS	INSTR REQ	18-6	Tape 40.11

THIS SECTION HAS BEEN  
DELETED. REFERENCE  
EVA MISSION RULES IN  
SECTION 3 OF THIS  
DOCUMENT.

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MISSION RULES

SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION

R	ITEM							
		<u>GENERAL</u>						
20-1		<p>A. BASELINE REQUIREMENTS (ALL PHASES EXCEPT LAUNCH)</p> <ol style="list-style-type: none"> <li>1. TWO-WAY VOICE COMM BETWEEN SPACECRAFT</li> <li>2. TWO-WAY VOICE COMM BETWEEN CSM OR LM AND MSFN DURING ALL DOCKED ACTIVITIES AND BETWEEN CSM, LM/LCRU AND MSFN DURING UNDOCKED ACTIVITIES</li> </ol> <p>B. LAUNCH</p> <p>THERE ARE NO COMMUNICATIONS FAILURES FOR WHICH THE LAUNCH/INSERTION PHASE WILL BE TERMINATED.</p> <p>C. LUNAR STAY ADDITIONAL REQUIREMENTS</p> <ol style="list-style-type: none"> <li>1. FOR TWO-MAN EVA: VOICE COMM BETWEEN MSFN AND ONE EVA CREWMAN</li> <li>2. FOR ONE-MAN EVA: VOICE COMM BETWEEN MSFN AND LM/LCRU AND EVA CREWMAN</li> </ol> <p style="text-align: center;"><u>NOTE</u> MSFN-TO-EVA-ONLY VOICE IS ACCEPTABLE IF TV IS AVAILABLE TO MONITOR CREW.</p> <p>D. THE LM WILL BE RETAINED FOR TEC COMM IN EVENT OF LOSS OF ALL COMM BETWEEN THE CSM AND THE GROUND.</p> <p>E. FAILURE OF VOICE OR TM TO THE MSFN, OR FAILURE OF TWO-WAY VOICE COMMUNICATIONS TO THE CMP, OR BOTH, WILL NOT PRECLUDE THE NOMINAL CMP EVA.</p>						
20-2		<p>VHF EVA COMMUNICATIONS PRIORITIES ARE:</p> <p>A. TWO-MAN EVA</p> <ol style="list-style-type: none"> <li>1. PRIME: EVA-1 AR/EVA-2 AR (RELAY MODE ALLOWS DUPLEX VOICE BETWEEN EVA'S PLUS THE TRANSMISSION OF VOICE AND DATA FROM BOTH EVA'S TO LM/LCRU PLUS THE RECEPTION OF VOICE VIA LM/LCRU BY BOTH EVA'S</li> <li>2. BACKUP: EVA-1 AR/EVA-2B OR EVA-1A/EVA-2B OR EVA-1B/EVA-2A (EITHER MODE COMBINATION ALLOWS DUPLEX VOICE BETWEEN EVA'S PLUS THE TRANSMISSION OF VOICE FROM BOTH THE EVA'S TO THE LM/LCRU PLUS THE TRANSMISSION OF DATA FROM ONE EVA TO THE LM/LCRU AND THE RECEIVING OF LM/LCRU VOICE BY ONE EVA)</li> </ol> <p>B. ONE-MAN EVA</p> <ol style="list-style-type: none"> <li>1. PRIME: EVA-1A OR EVA-2A (ALLOWS DUPLEX VOICE BETWEEN EVA AND THE LM/LCRU PLUS THE TRANSMISSION OF DATA FROM EVA TO LM/LCRU)</li> <li>2. BACKUP: EVA-1B OR EVA-2B (ALLOWS DUPLEX VOICE BETWEEN EVA AND LM)</li> </ol> <p style="text-align: center;"><u>NOTE</u> NO VOICE CAPABILITY VIA LCRU IN THIS MODE.</p> <p>RULES 20-3 THROUGH 20-6 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	FUNCTIONAL COMM-GENERAL	20-1	Tape 24.1

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	ITEM							
		<u>MANAGEMENT</u>						
	20-7	<p><u>VOICE CONFIGURATION</u></p> <p>A. LM/CSM/MSFN</p> <ol style="list-style-type: none"> <li>1. VHF DUPLEX B AND USB WILL BE TRANSMITTED/RECEIVED SIMULTANEOUSLY FOR LAUNCH THROUGH CY1, REV 1. VHF SIMPLEX A AND USB WILL BE TRANSMITTED/RECEIVED SIMULTANEOUSLY FOR EARTH ORBIT AFTER CY1, REV 1 LOS.</li> <li>2. VHF A SIMPLEX 296.8 MHZ IS PRIME VOICE COMM BETWEEN VEHICLES EXCEPT DURING RANGING WHEN DUPLEX B (CSM) AND DUPLEX A (LM) WILL BE USED.</li> <li>3. VHF B SIMPLEX 259.7 MHZ IS BACKUP TO VHF A SIMPLEX 296.8 MHZ</li> <li>4. USB IS PRIME VOICE COMM BETWEEN MSFN AND CSM, LM, OR LCRU.</li> <li>5. USB/VHF RELAY IS VOICE COMM BACKUP TO USB BETWEEN MSFN AND MALFUNCTIONED S/C.</li> <li>6. NORMAL VOICE COMM WILL USE SIMULTANEOUS MSFN UPLINK TO BOTH VEHICLES. HOWEVER, IF REQUIREMENT SHOULD EXIST, SIMULTANEOUS INDEPENDENT MSFN/CSM, MSFN/LM, AND MSFN/LCRU COMM MODES WILL BE INITIATED.</li> <li>7. THE PRIME CSM/LM COMMUNICATIONS MODE DURING THE LUNAR ORBIT PHASE IS VHF. THE PRIME VHF MODE IS VHF A SIMPLEX UNLESS THIS MODE IS PRECLUDED BY THE USE OF VHF RANGING. DURING LUNAR STAY PHASE, THE PRIME CSM/LM/LCRU MODE IS MSFN RELAY.</li> <li>8. THE CSM AND LM WILL TRANSMIT SIMULTANEOUSLY ON VHF AND USB DURING ALL LM POWERED UP PHASES IN LUNAR ORBIT.</li> <li>9. IN THE EVENT OF A COMPLETE LOSS OF CSM S-BAND COMMUNICATIONS WITH MSFN, THE LM WILL BE CONFIGURED FOR LM TWO-WAY RELAY AND RETAINED FOR TEI AND TEC.</li> </ol> <p>B. LM/EVA/MSFN</p> <p>LM/LCRU TWO-WAY RELAY WITH TWO-MAN EVA IS THE PRIME MODE PLANNED FOR EVA OPERATION.</p>						
	20-8	<p><u>CSM VHF/USB MANAGEMENT</u></p> <ol style="list-style-type: none"> <li>A. FOR CREW REST PERIODS, CSM S-BAND ANTENNAS WILL BE SELECTED BY GROUND COMMANDS.</li> <li>B. NORMAL CONTROL OF THE S-BAND MODES WILL BE BY GROUND COMMAND. CSM COMMUNICATIONS SWITCH POSITION WILL REFLECT OUT-OF-SITE CONTACT CONFIGURATION.</li> </ol>						
			MISSION	REV	DATE	SECTION	GROUP	PAGE
			APOLLO 17	FNL	9/1/72	COMM AND INST	FUNCTIONAL COMM-MGT	20-2
								Tape 24.2

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	ITEM															
	20-9	<p><u>LM STEERABLE ANTENNA MANAGEMENT</u></p> <p>A. LM UPLINK MODES 2 AND 3 AND ALL PRN UPLINKS WILL BE AVOIDED IF POSSIBLE WHEN THE STEERABLE ANTENNA IS OPERATING IN THE AUTO TRACK MODE.</p> <p>B. THE STEERABLE ANTENNA TEMP SHOULD BE MAINTAINED BETWEEN -65° F AND 150° F. THE STEERABLE ANTENNA MAY BE OPERATED TO 195° F DURING CRITICAL MISSION PHASES.</p>														
	20-10	<p><u>GCTA MANAGEMENT</u></p> <p>A. THE COLOR TV CAMERA WILL NOT BE POINTED SUCH THAT THE SUN WILL BE IN THE FIELD OF VIEW. THE CAMERA MAY BE POINTED NEAR THE SUN. HOWEVER, IF OBJECTIONABLE FLARE OCCURS, THE GROUND WILL REQUEST THE CAMERA TO BE MOVED OR WILL MOVE THE CAMERA VIA GROUND COMMANDS.</p> <p>B. THE GROUND WILL MONITOR THE TV PICTURE AND RECOMMEND CAMERA MOVEMENT (OR MOVE THE CAMERA VIA COMMANDS) TO PREVENT IRREVERSIBLE VIDICON TUBE BURNS FROM REFLECTIVE OBJECTS.</p> <p>C. BETWEEN EVA'S THE TV CAMERA WILL BE LOCATED IN THE SUN AND OFF TO MAINTAIN THERMAL BALANCE.</p> <p>D. RESERVED</p> <p>E. WHEN A BRIGHT OBJECT, WITH A CONTRASTING DARK BACKGROUND IS IN THE FIELD OF VIEW, THE GROUND WILL RECOMMEND OR COMMAND AN ALC SWITCH SETTING TO GET THE BEST PICTURE. THE ALC-PEAK WILL GIVE THE BEST PICTURE OF THE BRIGHT OBJECT, AND THE ALC-AVERAGE WILL GIVE THE BEST PICTURE OF THE DARK BACKGROUND.</p> <p>F. THE GROUND WILL NEVER INITIATE GCTA COMMANDS THAT WOULD CAUSE MORE THAN TWO DRIVE MOTORS TO OPERATE SIMULTANEOUSLY.</p> <p>G. THE GCTA WILL BE POSITIONED VIA GROUND COMMAND AS NECESSARY TO PROVIDE THERMAL MANAGEMENT.</p> <p>H. THE TV CAMERA AND THE TV CONTROL UNIT WILL BE DUSTED AT EACH STOP.</p>														
	20-11	<p><u>LCRU MANAGEMENT</u></p> <p>A. THE THERMAL BLANKETS ON THE LCRU WILL BE POSITIONED AS REQUIRED TO MAINTAIN THERMAL MANAGEMENT.</p> <p>B. NOMINAL MODE OF OPERATION FOR MOVING IS PM1/WB1.            NOMINAL MODE OF OPERATION FOR FIXED BASE IS FM/TV.            BACKUP MODE OF OPERATION FOR MOVING IS PM1/NB.            THE CONTINGENCY MODE FOR MOVING IS PM2/NB.            THE TV REMOTE MODE WILL BE UTILIZED TO OBTAIN THE CLEAREST TV PICTURE (THIS MODE ALLOWS THE GROUND TO COMMAND OFF THE VOICE DOWNLINK AND WILL BE USED FOR LM ASCENT TV COVERAGE).</p> <p>C. THE THERMAL BLANKETS ON THE LCRU SHOULD BE OPENED 100 PERCENT FOR EITHER HANDCARRY MODE. THE CREW SHOULD RETAIN THE THERMAL BLANKET FOR POSSIBLE FUTURE USE.</p> <p>D. THE LCRU BATTERY WILL BE CHANGED WHEN THE VOLTAGE IS 27.5 V IF STOPPED OR, IF MOVING, AT THE NEXT STOP.</p> <p>E. THE LCRU WILL BE DUSTED AT EACH STOP.</p>														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 15%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 25%;"></th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>COMMAND INST</td> <td>FUNCTIONAL COMM-MGT</td> <td>20-3</td> <td style="text-align: right;">Tape 52.10</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	COMMAND INST	FUNCTIONAL COMM-MGT	20-3	Tape 52.10
MISSION	REV	DATE	SECTION	GROUP	PAGE											
APOLLO 17	FNL	9/1/72	COMMAND INST	FUNCTIONAL COMM-MGT	20-3	Tape 52.10										

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MISSION RULES

SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	ITEM						
	20-12	<p><u>SDS MANAGEMENT</u></p> <p>A. THE CSM PCM WILL BE OPERATED IN HBR DURING ALL SCIENTIFIC OPERATIONS, EXCEPT FOR PORTIONS OF LUNAR SOUNDER OPERATIONS.</p> <p>B. THE CONTROL OF THE DSE WILL BE VIA GROUND COMMAND WHENEVER POSSIBLE. HOWEVER, THE CREW MAY BE REQUESTED TO OPERATE THE DSE AT CERTAIN TIMES DURING AWAKE PERIODS TO ASSIST IN OBTAINING THE MAXIMUM AMOUNT OF SCIENTIFIC DATA.</p>					
	MISSION	REV	DATE	SECTION	GROUP	PAGE	
	APOLLO 17	FNL	9/1/72	COMM AND INST	FUNCTIONAL COMM-MGT	20-4	Tape 52.11

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MISSION RULES

SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				<u>SPECIFIC</u>				
	20-13	LOSS OF TWO-WAY VHF VOICE COMM BETWEEN CSM AND LM	DOCKED	<u>CONTINUE MISSION</u> NO-GO FOR SEP MNVR	REF LM MAL PROC COMM 3 - LOSS OF VHF VOICE COMM WITH CSM			
			UNDOCKED	<u>DOCK ASAP</u> NO-GO FOR CSM CIRC AND DOI <sub>2</sub>	REF CSM MAL PROCEDURE COMM 5 - LOSS OF VHF COMM WITH LM NOTE: MSFN RELAY MAY BE UTILIZED.			
			PRE-PDI	<u>CONTINUE MISSION</u>				
			POWERED DESCENT	<u>CONTINUE MISSION</u>				
			LUNAR STAY	<u>CONTINUE MISSION</u>				
	20-14	LOSS OF TWO-WAY VOICE COMM WITH MSFN	LAUNCH	A.1. <u>CONTINUE MISSION</u>	REF CSM MAL PROCEDURES 7 AND 8 - LOSS OF CSM VOICE COMM			
		A. CSM ONLY	EARTH ORBIT	2. <u>ENTER NEXT BLOCK DATA POINT</u>				
			TLC	3. <u>CONTINUE MISSION</u>	A.3 ENTER LM EARLY TO USE LM S-BAND FOR VOICE COMM WITH MSFN. LM COMM WILL BE USED FOR VOICE, AND CSM TM USED FOR SIM BAY SCIENCE OPERATIONS.			
			DDI	4. <u>CONTINUE MISSION</u> NO-GO FOR SEP MANEUVER				
			UNDOCKED/POWERED DESCENT	5. <u>CONTINUE MISSION</u>				
			LUNAR STAY	6. <u>CONTINUE MISSION</u>	A.6 UTILIZE VHF OF VHF RELAY FROM LM. IF UNABLE, TERMINATE LUNAR STAY AND PERFORM A DOCKED TEI. NOTE: RETAIN LM FOR COMM DURING TEC.			
		B. LM ONLY	DOCKED	B.1. <u>CONTINUE MISSION</u> NO-GO FOR SEP MANEUVER	REF LM MAL PROC COMM 4 - LOSS OF S-BAND VOICE COMM			
			UNDOCKED PRE-PDI	2. <u>RETURN TO VICINITY OF CSM</u> NO-GO FOR PDI				
			POWERED DESCENT	3. <u>PDI TO TOUCHDOWN - CONTINUE MISSION</u>				
			LUNAR STAY	4. <u>LM LIFTOFF NEXT ASCENT OPPORTUNITY</u>	B.4 COMM VIA LCRU IS ACCEPTABLE.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	FUNCTIONAL COMM-SPECIFIC	20-5	Tape 24.5

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	20-15	LOSS OF TWO CSM AUDIO CENTERS	EPO  TLC  DOCKED  UNDOCKED  PRE-PDI/ DESCENT/ LUNAR STAY  POST DOCK	<u>CONTINUE MISSION</u>  NO-GO FOR TLI  <u>CONTINUE MISSION</u>  <u>CONTINUE MISSION</u>  NO-GO FOR DOI OR UNDOCKING  NO-GO FOR CIRC  <u>CONTINUE MISSION</u>  <u>RETAIN ASCENT STAGE</u>				
	20-16	FAILURE OF LM VHF RELAY. NO TWO-WAY VOICE WITH EITHER CREWMAN.	LUNAR STAY	<u>CONTINUE MISSION</u>  PROCEED WITH EVA AND ACTIVATE THE LCRU ASAP				
	20-17	LOSS OF VOICE FROM EVA-2 TO EVA-1	DUAL EVA	<u>CONTINUE MISSION</u>  EVA-2 GO TO POSITION "B"	EVA-1 (CDR) HAS EVC-1, EVA-2 (LMP) HAS EVC-2. IF ON LCRU:  1. EVA 2 CANNOT COMMUNICATE WITH MSFN.  2. NO TM FROM EVA-2.  3. EVA 2 MUST PROCEDURALLY TIME-SHARE ALL VOICE TRANSMISSIONS WITH MSFN.  4. MODES WILL BE SWITCHED EVERY 45 MIN TO MONITOR PLSS DATA ON BOTH CREWMEN.			
	20-18	LOSS OF VOICE FROM EVA-1 TO EVA-2	DUAL EVA	<u>CONTINUE MISSION</u>  A. EVA-2 GO TO POSITION "A"  B. EVA-1 GO TO POSITION "B"	IF ON LCRU:  B.1. EVA-1 CANNOT COMMUNICATE WITH MSFN AND NO TM.  2. EVA-1 MUST PROCEDURALLY TIME-SHARE ALL VOICE TRANSMISSIONS WITH MSFN.  3. MODES WILL BE SWITCHED EVERY 45 MINUTES TO MONITOR PLSS DATA ON BOTH CREWMEN.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	FUNCTIONAL COMM-SPECIFIC	20-6	Tape 24.6

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	20-19	LOSS OF DUPLEX VOICE BETWEEN EVA-1 AND EVA-2	DUAL EVA	<u>CONTINUE EVA</u> A. BOTH CREWMEN WILL GO TO POSITION "A"  B. IF STILL NO COMM, SELECT POSITION "B"  C. IF STILL NO COMM, CONTINUE EVA IF ONE CREWMAN CAN RECEIVE MSFN VOICE. IF NOT ABLE TO RECEIVE MSFN VOICE, RETURN TO VHF RANGE OF LM.	A.1. SIMPLEX CONFIGURATION WILL REQUIRE PTT OPERATION VICE VOX.  2. DATA WILL ONLY BE TRANSMITTED WHEN THE TRANSMITTER IS KEYED.  B. EVCS MODE-B WILL NOT COMMUNICATE WITH LCRU.			
	20-20	LOSS OF TWO-WAY VOICE BETWEEN MSFN AND EVA  A. LCRU         B. LM	DUAL EVA	VOICE UPLINK WITH TV AVAILABLE FOR MSFN MONITORING OF CREW RESPONSES IS ACCEPTABLE  A. <u>CONTINUE EVA</u> 1. EVA-2 GO TO POSITION "A" EVA-1 GO TO POSITION "B"  2. IF SUCCESSFUL, CONTINUE EVA.  3. IF UNSUCCESSFUL, RETURN TO VHF RANGE OF LM.  B. <u>CONTINUE EVA</u> 1. IF LCRU AVAILABLE, ACTIVATE ASAP AND CONTINUE EVA.  2. IF LCRU NOT AVAILABLE, EVA 2 RETURN TO LM AND RECONFIGURE COMM. THEN CONTINUE EVA WITHIN VHF RANGE OF LM.	A.1. EVCS MODE-B WILL NOT COMMUNICATE WITH LCRU.			
	20-21	LOSS OF TWO-WAY VOICE BETWEEN MSFN AND EVA  A. LCRU         B. LM	ALT EVA (ONE-MAN)	VOICE UPLINK WITH TV AVAILABLE FOR MSFN MONITORING OF CREW RESPONSES IS ACCEPTABLE  A.1. ATTEMPT TO RECONFIGURE EVCS.  2. IF SUCCESSFUL, CONTINUE EVA.  3. IF NOT SUCCESSFUL, RETURN TO VHF RANGE OF LM AND CONTINUE EVA.  B.1. IF LCRU AVAILABLE, ACTIVATE ASAP AND CONTINUE EVA  2. IF LCRU NOT AVAILABLE, RETURN TO LM AND RECONFIGURE COMM. THEN CONTINUE EVA WITHIN VHF RANGE OF LM				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	FUNCTIONAL COMM-SPECIFIC	20-7	Tape 24.7

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MISSION RULES

SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	20-22	LOSS OF LCRU	EVA	<u>CONTINUE EVA</u> RETURN TO WITHIN VHF RANGE OF LM				
	20-23	LOSS OF LCRU HGA	EVA	<u>CONTINUE EVA</u> USE LGA	BY SWITCHING ANTENNA CONNECTIONS ON LCRU, TV AVAILABLE TO 210 FT SITE.			
	20-24	LOSS OF LCRU LGA	EVA	<u>CONTINUE EVA</u> IF LOST DURING MOVING MODE, CONTINUE TO NEXT STOP AND REGAIN COMM VIA HGA.	HGA CANNOT BE USED FOR MOVING COMM.			
	20-25	LOSS OF LCRU BATTERY	EVA	<u>CONTINUE EVA</u> A. PRIOR TO TRAVERSE-INSTALL BATTERY ASSIGNED TO NEXT EVA. B. DURING TRAVERSE-SWITCH TO LRV POWER UNTIL NEXT STOP, THEN INSTALL BATTERY FROM PREVIOUS EVA.	A. THE LAST EVA TRAVERSE WILL BE PLANNED BASED ON LRV POWER AVAILABLE. B. LCRU BATTERY FROM PREVIOUS EVA WILL BE CARRIED ON THE LRV.			
	20-26	LOSS OF LCRU MOVING COMM MODE	EVA	<u>CONTINUE EVA</u> WHEN NEXT STOP IS REACHED, SWITCH ANTENNA CONNECTIONS AND USE FM/TV OR TV REMOTE MODE.	MOVING MODES: PRI - PM1/WB B/U - PM1/NB CONT - PM2/NB			
	20-27	LOSS OF PM1 TRANSMITTER OR RECEIVER	EVA	<u>CONTINUE EVA</u> A. MOVING COMM-SWITCH LGA TO HGA CONNECTION PORT. B. STOPPED COMM- 1. 210 FT SITE AVAILABLE, RETAIN SWITCHED CONFIGURATION 2. 210 FT SITE NOT AVAILABLE, RETURN TO NORMAL CONFIGURATION.	B.1. TV AVAILABLE TO 210 FT SITE ON LGA B.2. TV AVAILABLE VIA HGA			
	20-28	LOSS OF TRANSMITTER 2	EVA	<u>CONTINUE EVA</u> SWITCH TO PM1 TRANSMITTER TO REGAIN VOICE AND TM	TV AND COMMAND CAPABILITY IS LOST.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	FUNCTIONAL COMM-SPECIFIC	20-8	Tape 25.1

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	20-29	LOSS OF RECEIVER 2	EVA	<u>CONTINUE EVA</u> LOSS OF COMMAND AND UP VOICE A. DURING GEOLOGICAL STOP, REMAIN IN FM/TV OR TV REMOTE B. DURING WALKING PART OF THE STOP, SELECT PM1/WB	A. CREW CAN MANUALLY POSITION CAMERA. B. TV AND COMMAND CAPABILITY IS LOST			
	20-30	LOSS OF LCRU VHF RECEIVER	EVA	<u>CONTINUE EVA</u> UTILIZE TV VISUAL RESPONSES OF CREW AS CUE TO RECEIPT OF MCC UPLINKS.				
	20-31	LOSS OF LCRU VHF TRANSMISSION	EVA	<u>CONTINUE EVA</u> RETURN TO VHF RANGE OF LM				
	20-32	LOSS OF LCRU TV (GCTA)	EVA	<u>CONTINUE EVA</u> A. BYPASS TCU BY RECABLING. LOSS OF COMMAND CONTROL WILL RESULT B. IF STILL NO TV, SELECT PM1/WB AND CONTINUE WITHOUT TV.	A. CREW CAN MANUALLY CONTROL CAMERA			
	20-33	LOSS OF COMMAND TO LCRU TV (GCTA)	EVA	<u>CONTINUE EVA</u> CREW MANUALLY CONTROL TV.				
	20-34	LOSS OF LCRU/GCTA TM	LUNAR STAY	<u>CONTINUE MISSION</u>	ONBOARD CREW READOUTS WILL BE REQUIRED.			
	20-35	LCRU TEMP MORE THAN 120 DEG F	LUNAR STAY	<u>CONTINUE MISSION</u> BEGIN DUTY CYCLE OPERATIONS	DUTY CYCLE: 5 MIN ON AND 10 MIN OFF			
	20-36	GCTA TEMP MORE THAN 122 DEG F	LUNAR STAY	<u>CONTINUE MISSION</u> REPOSITION CAMERA	MANUAL OR BY GROUND COMMAND			
		RULE NUMBERS 20-37 THROUGH 20-40 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	FUNCTIONAL COMM-SPECIFIC	20-9	Tape 25.2

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	ITEM								
		<u>CSM - GENERAL</u>							
20-41	A. BASELINE REQUIREMENT (ALL PHASES EXCEPT LAUNCH)	<p>CRITICAL INSTRUMENTATION - CRITICAL INSTRUMENTATION IS THAT INSTRUMENTATION REQUIRED TO VERIFY MISSION GO/NO-GO CRITERIA.</p>							
	B. LAUNCH	<p>THERE ARE NO CSM INSTRUMENTATION FAILURES FOR WHICH THE LAUNCH/INSERTION PHASE WILL BE TERMINATED.</p>							
	C. POWERED DESCENT ADDITIONAL REQUIREMENTS	<p>THERE ARE NO CSM INSTRUMENTATION SYSTEMS FAILURES FOR WHICH LM POWERED DESCENT WILL BE TERMINATED.</p>							
20-42	THE MISSION WILL BE CONTINUED WITH THE LOSS OF THE:								
	A. CSM UPDATA LINK								
	B. CSM CAUTION AND WARNING SYSTEM								
	C. CSM DSE								
	D. CSM HIGH GAIN ANTENNA								
	E. CSM FM DOWNLINK								
	F. CSM USB RANGING (PRN)								
	G. VHF RANGING								
	H. SDS								
		<p>RULES 20-43 THROUGH 20-45 ARE RESERVED</p>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE		
		APOLLO 17	FNL	9/1/72	COMM AND INST	CSM INST GENERAL	20-10	Tape 25.3	

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	ITEM							
		<u>CSM - MANAGEMENT</u>						
	20-46	<p><u>DSE MANAGEMENT</u></p> <p>A. LM AND CSM LOW-BIT-RATE TELEMETRY WILL BE RECORDED CONTINUOUSLY WHEN NOT IN CONTACT WITH GROUND TELEMETRY SITES EXCEPT DURING PERIODS OF ORBITAL SCIENCE OPERATIONS WHEN CSM HBR WILL BE RECORDED WITH THE EXPERIMENT DATA AND DURING PERIODS OF VHF RANGING WHEN NO LM TM WILL BE RECORDED. LM AND CSM LOW-BIT-RATE TELEMETRY WILL BE NORMALLY PLAYED BACK AT LEAST ONCE PER REVOLUTION IN LUNAR ORBIT.</p> <p>B. CM HIGH-BIT-RATE DSE RECORDINGS WILL BE MADE DURING THE FOLLOWING OPERATIONS:</p> <ol style="list-style-type: none"> <li>1. LAUNCH</li> <li>2. TLI</li> <li>3. S-IVB/CSM SEPARATION</li> <li>4. TD&amp;E</li> <li>5. ALL SPS MANEUVERS AND MIDCOURSE CORRECTIONS</li> <li>6. DOCKING AND UNDOCKING</li> <li>7. CM/SM SEPARATION AND ENTRY</li> <li>8. DTO REQUIREMENTS</li> <li>9. LM FINAL SEP</li> <li>10. ORBITAL SCIENCE OPERATIONS</li> </ol> <p>C. DURING SLEEP PERIODS</p> <p>USING HIGH GAIN ANTENNAS, DSE RECORDING AND DUMPING WILL BE MANAGED PER "A" ABOVE.</p>						
	20-47	<p><u>CTE MANAGEMENT</u></p> <p>A. CTE WILL BE CONFIGURED TO CLOCK IN GET FOR FLIGHT. HOWEVER, IF A HOLD OCCURS AFTER T-15 MINUTES, CTE WILL NOT BE CORRECTED UNTIL COMPLETION OF POWERED FLIGHT.</p> <p>B. CTE WILL BE ALLOWED TO DRIFT ±5 SEC BEFORE BEING UPDATED AFTER ORBIT INSERTION.</p> <p>RULE NUMBERS 20-48 THROUGH 20-50 ARE RESERVED</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	CSM INST MANAGEMENT	20-11	Tape 25.4

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				<u>CSM - SPECIFIC</u>				
	20-51	LOSS OF CSM TM A. HBR OR LBR B. ALL TM	ALL LAUNCH EO ALL	A. <u>CONTINUE MISSION</u> B.1. <u>CONTINUE MISSION</u> 2. <u>ENTER NEXT BEST PTP</u> 3. <u>CONTINUE MISSION</u>	REF CSM MAL PROCEDURE COMM 10 - MSFN REPORTS LOSS OF REAL-TIME PCM. DSE MAY BE UTILIZED FOR TM IF AVAILABLE.			
	20-52	LOSS OF CRITICAL INSTRUMENTATION	LAUNCH EO  TLC  LO	<u>CONTINUE MISSION</u> <u>ENTER NEXT BEST PTP</u>  <u>NO-GO FOR TLI</u> <u>CONTINUE MISSION</u> <u>NO-GO FOR LOI</u> <u>NO-GO FOR LUNAR OPERATIONS</u>				
	20-53	LOSS OF ONE CSM PMP POWER SUPPLY	ALL	<u>CONTINUE MISSION</u>				
	20-54	LOSS OF BOTH CSM POWER AMPLIFIERS	EPO ALL  SCIENCE	<u>NO-GO FOR TLI</u> CONTINUE MISSION IF HIGH GAIN ANT IS AVAILABLE  CONTINUE MISSION BASED ON AMOUNT OF SCIENCE DATA THAT CAN BE OBTAINED				
	20-55	LOSS OF THE SCE	ALL	<u>CONTINUE MISSION</u>				
	20-56	COMPLETE OR PARTIAL LOSS OF SCIENTIFIC TM	ALL  SCIENCE	<u>CONTINUE MISSION</u>  CONTINUE MISSION BASED ON AMOUNT OF SCIENCE DATA THAT CAN BE OBTAINED.				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	CSM INST MANAGEMENT	20-12	Tape 65.1

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	20-57	LOSS OF FM TRANSMITTER	ALL SCIENCE	<u>CONTINUE MISSION</u>  CONTINUE MISSION BASED ON AMOUNT OF SCIENTIFIC DATA THAT CAN BE OBTAINED				
	20-58	LOSS OF HGA	ALL SCIENCE	<u>CONTINUE MISSION</u>  CONTINUE MISSION BASED ON AMOUNT OF SCIENTIFIC DATA THAT CAN BE OBTAINED				
	20-59	LOSS OF DSE	ALL SCIENCE	<u>CONTINUE MISSION</u>  <u>CONTINUE MISSION</u>  ONLY REAL-TIME DATA WILL BE AVAILABLE				
		RULE NUMBERS 20-60 THROUGH 20-65 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	CSM INST MANAGEMENT	20-13	Tape 65.2

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	ITEM							
		<u>LM - GENERAL</u>						
20-66	A.	BASELINE REQUIREMENT						
		CRITICAL INSTRUMENTATION - CRITICAL INSTRUMENTATION IS THAT INSTRUMENTATION, ONBOARD OR TM DURING MSFN AOS, OR ONBOARD ONLY DURING MSFN LOS, REQUIRED TO VERIFY MISSION GO/NO-GO CRITERIA.						
		B. LUNAR STAY ADDITIONAL REQUIREMENTS						
		LM LBR OR HBR TM IS REQUIRED. IF LM TM DATA IS LOST DURING AN EVA, THAT EVA WILL BE CONTINUED.						
20-67	THE MISSION WILL BE CONTINUED WITH THE LOSS OF THE:							
		A. LM UPDATA LINK						
		B. LM CAUTION AND WARNING SYSTEM						
		C. LM DSEA						
		D. EVA TELEMETRY						
		E. LM FM DOWNLINK						
		F. LM USB RANGING (PRN)						
		G. VHF RANGING						
		H. GCTA						
		I. LCRU						
		RULE NUMBERS 20-68 THROUGH 20-70 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	COMM AND INST	LM INST-GENERAL	20-14	Tape 25.7

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## MISSION RULES

### SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

R	ITEM						
		<u>LM - MANAGEMENT</u>					
	20-71	<p><u>LM USB/TM MANAGEMENT</u></p> <p>A. FOR NORMAL LM POWERED-UP PHASES, THE LM STEERABLE ANTENNA WITH THE POWER AMPLIFIER WILL BE USED. DURING LUNAR STAY, THE POWER AMPLIFIER WILL BE TURNED OFF. LBR TM, PLSS AND VOICE CIRCUIT MARGINS ARE ADEQUATE.</p> <p>B. DURING PERIODS OF LM OUT-OF-STATION CONTACT (LUNAR FAR SIDE), THE TM BIT RATE WILL BE SWITCHED FROM HBR TO LBR AND TRANSMITTED TO THE CSM OVER VHF B EXCEPT DURING VHF RANGING AND PERIODS OF CRITICAL VOICE COMMUNICATIONS.</p>					
	20-72	<p><u>SYSTEM MONITORING</u></p> <p>DURING SLEEP PERIODS TBD CREWMEN WILL SLEEP WITH HEADSETS TO MONITOR FOR MASTER ALARMS OR GROUND COMMUNICATIONS.</p> <p>RULE NUMBERS 20-73 THROUGH 20-75 ARE RESERVED.</p>					
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	COMM AND INST	LM INST-MANAGEMENT	20-15
							Tape 26.1

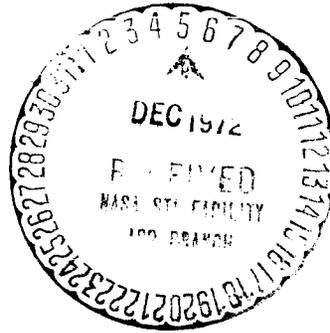


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## MISSION RULES

### SECTION 20 - COMMUNICATION AND INSTRUMENTATION - CONCLUDED

R	ITEM	CSM - INSTRUMENTATION REQUIREMENTS					
		<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>TRANSDUCERS</u>	<u>CATEGORY</u>	<u>MISSION RULE REF</u>
	20-81	UDL VALIDITY SIGNAL	CT0262V	-	-	HD	20-42
		USB RECEIVER AGC	CT0620E	METER	COMMON	HD	20-42,20-7A(9), 20-88
		USB RECEIVER ERROR	CT0604F	-	-	HD	
		DSE TAPE MOTION	CT0012X	TB	-	HD	20-42,20-46
		CTE TIME	CT0145F	-	-	HD	20-47
		SCE 10 VDC	CT0018V	-	-	HD	
		SCE 5 VDC	CT0017V	-	-	HD	
		SCE 20 VDC	CT0015V	-	-	HD	
		SCE -20 VDC	CT0016V	-	-	HD	
		PCM HI REF 85 PERCENT	CT0125V	-	-	HD	
		PCM HI REF 15 PERCENT	CT0126V	-	-	HD	
		HI GAIN ANT POS-PITCH	ST0152H	-	-	HD	
		HI GAIN ANT POS-YAW	ST0153H	-	-	HD	
		HGA BEAM WIDTH SW POS - NAR	CT0161X	-	-	HD	
		HGA BEAM WIDTH SW POS - MED	CT0162X	-	-	HD	
		HGA TRACK SW POS - AUTO	CT0163X	-	-	HD	
		HGA TRACK SW POS - REACQ	CT0164X	-	-	HD	
		MASTER UNIT TEMP	ST0562T			HD	20-56
		SLAVE UNIT TEMP	ST0563T			HD	20-56
		LM - INSTRUMENTATION REQUIREMENTS					
	20-82	<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>TRANSDUCERS</u>	<u>CATEGORY</u>	<u>MISSION RULE REF</u>
		PCM OSC FAIL 2	GL0422V	-	-	1 OF 2	
		PCM OSC FAIL 3	GL0423V	-	-	HD	
		CAL 85 PCT	GL0401V	-	-	HD	
		CAL 15 PCT	GL0402V	-	-	HD	
		MET	GL0501W	-	-	HD	
		C AND W FAIL	GL4054X	CAUTION	-	HD	
		MASTER ALARM	GL4069X	MASTER ALARM	-	HD	
		DUA STATUS	GT0441X	-	-	HD	20-67
		S-BND ST PH ERR	GT0992B	-	-	HD	
		S-BND RCVR SIG	GT0994V	METER /CAUTION	-	HD	20-67
		STEERABLE ANT TEMP	GT0454	METER /CAUTION	-	HD	20-98,20-71
		XMTR PO	GT0993	-	-	HD	20-67,20-76
		LCRU RADIATOR TEMP	RT8001T	METER	REDUNDANT	HD	20-34
		LCRU SUBSYSTEMS VOLTAGE	RT8003T	METER	-	HD	20-34
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	COMM AND INST	PRELAUNCH REQMTS	20-17
							Tape 26.3



NOTE

SECTION 21 NOW COVERS  
LM/EMU INSTRUMENTATION.

FORMER LM SECTIONS 21  
THROUGH 27 HAVE BEEN  
DELETED TO ELIMINATE  
DUPLICATION BETWEEN  
THEM AND THE LM TELMU  
AND CONTROL SUMMARY  
RULES IN SECTION 3.

~~21 LM/EMU  
INSTRUMENTATION~~

~~21 LM SEQUENTIAL  
AND PYROTECHNIC~~

~~22 LM ELECTRICAL  
POWER~~

~~23 LM ENVIRONMENTAL  
CONTROL~~

~~24 LM GUIDANCE  
AND CONTROL~~

~~25 LM DFS~~

~~26 LM APS~~

~~27 LM REACTION  
CONTROL SYSTEM~~

28 SPACE  
ENVIRONMENT

29 RECOVERY

30 AEROMEDICAL

31 LUNAR SURFACE  
OPERATIONS

32 ALSEP

~~33 LUNAR ORBIT  
EXPERIMENTS~~

APPENDICES

A ACRONYMS AND  
SYMBOLS

B DISTRIBUTION  
LIST

C CHANGE CONTROL

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## MISSION RULES

### SECTION 21 - LM/EMU INSTRUMENTATION

R	ITEM	INSTRUMENTATION REQUIREMENTS					
		<u>SYSTEM</u>	<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>CATEGORY</u>	
		SEQUENTIAL/ PYROTECHNIC	ED RLY A K1-K6	GY0201X	SYS A STAGING LIGHT	HD	
						COMMON CAUTION LIGHT	HD
				ED RLY B K1-K6	GY0202X	SYS B STAGING LIGHT	HD
				ED RLY A K7-K15 ED RLY B K7-K15 SELECTED ED BAT	GY0231X GY0232X -----	----- ----- METER	HD HD HD HD
		ELECTRICAL POWER	AC BUS FREQ	GC0155F	CAUT	1 OF 2	
				AC BUS VOLTS	GC0071V	METER, CAUT	M
				BAT 1 CUR	GC1201C	METER	1 OF 3 M PCM
				BAT 2 CUR	GC1202C	METER	
				BAT L CUR	GC1207C	METER	1 OF 3 M PCM
				BAT 3 CUR	GC1203C	METER	
				BAT 4 CUR	GC1207C	METER	
				LMP BUS VOLTS	GC0302V	METER, CAUT	2 OF 3 M
				BAT 1 VOLTS	GC0201V	METER	
				BAT 2 VOLTS	GC0202V	METER	
				BAT 5 VOLTS	GC0205V	METER	
				CDR BUS VOLTS	GC0301V	METER, CAUT	2 OF 3 M
				BAT 3 VOLTS	GC0203V	METER	
				BAT 4 VOLTS	GC0204V	METER	
				BAT 6 VOLTS	GC0206V	METER	
				BAT L VOLTS	GC0207V	METER	
				BAT 5 CUR	GC1205C	METER	1 OF 2 M PCM
				BAT 6 CUR	GC1206C	METER	
				BAT 1 MAL	GC9961U	CAUT, COMP	HD
				BAT 2/L MAL	GC9962U	CAUT, COMP	HD
				BAT 3/L MAL	GC9963U	CAUT, COMP	HD
				BAT 4 MAL	GC9964U	CAUT, COMP	HD
				BAT 5 MAL	GC9965U	CAUT, COMP	HD
			BAT 6 MAL	GC9966U	CAUT, COMP	HD	
			BATTERY MAL	GL4047X	COMP	HD	
			BAT 1 LOW TAP	GC4362X	FLAG	HD	
			BAT 4 LOW TAP	GC4368X	FLAG	HD	
			BAT 5 B/U CDR	GC4369X	FLAG	HD	
			BAT 6 NORM CDR	GC4372X	FLAG	HD	
<p><u>NOTE</u></p> <p>LOSS OF SEVERAL HD MEASUREMENTS WILL CAUSE SEVERELY DEGRADED MISSION MONITORING CAPABILITY.</p>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	LM/EMU INSTRUMENTATION	LM TELMU	21-1
						Tape 60.6	

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MISSION RULES

SECTION 21 - LM/EMU INSTRUMENTATION - CONTINUED

R	ITEM	SYSTEM	MEAS DESCRIPTION	PCM	ONBOARD	CATEGORY
		ENVIRONMENTAL CONTROL	SUIT PRESS	GF1301P	METER WARNING	HD HD
			CABIN PRESS	GF3571P	METER }	1 OF 3
			U/H RLF PRESS	GF3591P	----- }	M
			F/H RLF PRESS	GF3592P	----- }	
			DES 2 O2 PRESS	GF0584P	METER }	1 OF 2
			DES 1 O2 PRESS	GF3584P	METER, CAUT }	M
			ASC 1 O2 PRESS	GF3582P	METER, CAUT }	1 OF 2
			ASC 2 O2 PRESS	GF3583P	METER, CAUT }	M
			GLYCOL PUMP DELTA P	GF2021P	----- }	
			SEC GLYCOL PUMP PRESS	GF2921P	----- }	1 OF 2
			GLYCOL PUMP PRESS	GF9997U	METER }	M
			SEL GLYCOL LVL LOW	GF9986U	CAUT }	
			GLYCOL TEMP	GF9998U	METER, CAUT }	
			GLYCOL OUTLET TEMP	GF2581T	----- }	
			SUIT TEMP	GF1281T	METER }	1 OF 2
			GLYCOL INLET TEMP	GF2531T	----- }	M
			DES 2 H2O PRESS	GF0500P	METER }	1 OF 2
			DES 1 H2O PRESS	GF4500P	METER }	M
			ASC 1 H2O QTY	GF4502P	METER }	1 OF 2
			ASC 2 H2O QTY	GF4503P	METER }	M
			PRI H2O REG DELTA P	GF4101P	-----	HD
			REPR ELEC OPEN	GF3572X	WARNING	HD
			CO2 PART PRESS	GF1521P	METER, CAUT, COMP	HD
			H2O SEP RATE	GF9999U	CAUT, COMP	HD
			SUIT DIV EGRESS	GF1221X	-----	HD

NOTE

LOSS OF SEVERAL HD MEASUREMENTS  
WILL CAUSE SEVERELY DEGRADED  
MISSION MONITORING CAPABILITY.

MISSION	REV	DATE	SECTION	GROUP	PAGE	
APOLLO 17	FNL	9/1/72	LM/EMU INSTRUMENTATION	LM TELMU	21-2	Tape 60.7

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## MISSION RULES

### SECTION 21 - LM/EMU INSTRUMENTATION - CONTINUED

R	ITEM	SYSTEM	MEAS DESCRIPTION	FM/FM PAM	ONBOARD	CATEGORY	
		EMU/EVA	FEED H2O PRESS LOW FEED H2O PRESS LOW VENT FLOW	GT8110P/GT8210P	TONE-FLAG TONE-FLAG	HD HD 1 OF 2	
			PLSS BAT CUR PLSS BAT VOLT LCG H2O TEMP PGA PRESS PGA PRESS LOW PGA PRESS	GT8140C/GT8240C GT8141V/GT8241V GT8154T/GT8254T GT8168P/GT8268P		M HD HD	
			SUBL O2 OUT TEMP PLSS-CO2 PP PLSS O2 PRESS PLSS O2 QTY IND HIGH O2 FLOW LCG H2O Δ T	GT8170T/GT8270T GT8175P/GT8275P GT8182P/GT8282P		HD HD HD HD HD HD	
			OPS PRESS GAGE OPS REG PRESS GAGE EVC CAL 0 VDC EVC CAL 5 VDC	GT8196T/GT8296T  GT8101V/GT8201V GT8102V/GT8202V	METER TONE-FLAG  METER METER	HD HD HD HD	
<p><u>NOTE</u></p> <p>LOSS OF SEVERAL HD MEASUREMENTS WILL CAUSE SEVERELY DEGRADED MISSION MONITORING CAPABILITY.</p>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 17	FNL	9/1/72	LM/EMU INSTRUMENTATION	LM TELMU	21-3
							Tape 60.8

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## MISSION RULES

### SECTION 21 - LM/EMU INSTRUMENTATION - CONTINUED

R	ITEM	INSTRUMENTATION REQUIREMENTS					
		<u>SYSTEM</u>	<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>CATEGORY</u>	
		GUIDANCE	LGC DOWNLINK	GG0001X	-	M	
		AND	PLS TORO REF	GG1040V	-	HD	
		CONTROL	2.5 VDC TM BIAS	GG1110V	-	HD	
			IMU 28 VAC 800	GG1201V	-	HD	
			IRIG SUSP 3.2 KC	GG1331V	-	HD	
			IMU STBY	GG1513X	-	HD	
			LGC OPR	GG1523X	-	HD	
			X PIPA OUT IN PHASE	GG2001V	-	HD	
			Y PIPA OUT IN PHASE	GG2021V	-	HD	
			Z PIPA OUT IN PHASE	GG2041V	-	HD	
			IG SVO ERR IN PHASE	GG2101V	-	HD	
			IG 1X RSVR OUT SIN	GG2112V	FDAI	HD	
			IG 1X RXVR OUT COS	GG2113V	FDAI	HD	
			MG SVO ERR IN PHASE	GG2137V	-	HD	
			MG 1X RSVR OUT SIN	GG2142V	FDAI	HD	
			MG 1X RSVR OUT COS	GG2143V	FDAI	HD	
			OG SVO ERR IN PHASE	GG2167V	-	HD	
			OG RSVR OUT SIN	GG2172V	FDAI	HD	
			OG RSVR OUT COS	GG2173V	FDAI	HD	
			PITCH ATT ERR	GG2219V	FDAI	HD-PCM	
			YAW ATT ERR	GG2249V	FDAI	HD-PCM	
			ROLL ATT ERR	GG2279V	FDAI	HD-PCM	
			PIPA TEMP	GG2300T*	C&W	HD-PCM	
			RR SHIFT SIN	GG3304V	FDAI	HD-PCM	
			RR SHIFT COS	GG3305V	FDAI	HD-PCM	
			RR TRUN SIN	GG3324V	FDAI	HD-PCM	
			RR TRUN COS	GG3325V	FDAI	HD-PCM	
			LGC WARNING	GG9001X	C&W	HD-PCM	
			ISS WARNING	GG9002X	C&W	HD-PCM	
			LR ANT TEMP	GN7563T	TEMP MONITOR	HD-PCM	
			RR NO TRACK	GN7621X	C&W	HD-PCM	
			RR ANT TEMP	GN7723T	TEMP MONITOR	HD-PCM	
			LR RNG BAD	GN7521X	C&W	HD	
			LR VEL BAD	GN7557X	C&W	HD	
			YAW ERR CMD	GH1247V	-	HD	
			PITCH ERR CMD	GH1248V	-	HD	
			ROLL ERR CMD	GH1249V	-	HD	
			JD A4D OUTPUT	GH1419V	-	HD	
			RCS TCP A4D	GR5023X	-	HD	
			JD B3D OUTPUT	GH1423V	-	HD	
			JD A2D OUTPUT	GH1427V	-	HD	
			RCS TCP A2D	GR5040X	-	HD	
			JD B1D OUTPUT	GH1431V	-	HD	
			RCS TCP B1D	GR5044X	-	HD	
			JD B4U OUTPUT	GH1418V	-	HD	
			JD B4F OUTPUT	GH1420V	-	HD	
			JD A4R OUTPUT	GH1421V	-	HD	
			JD A3U OUTPUT	GH1422V	-	HD	
			JD B3A OUTPUT	GH1424V	-	HD	
			JD A3R OUTPUT	GH1425V	-	HD	
			JD B2U OUTPUT	GH1426V	-	HD	
			JD A2A OUTPUT	GH1428V	-	HD	
			JD B2L OUTPUT	GH1429V	-	HD	
			JD A1U OUTPUT	GH1430V	-	HD	
			JD A1F OUTPUT	GH1432V	-	HD	
			JD B1L OUTPUT	GH1433V	-	HD	
* INDICATES SEPARATE TRANSDUCERS USED FOR ONBOARD AND PCM							
<u>NOTE</u> LOSS OF SEVERAL HD MEASUREMENTS WILL CAUSE SEVERELY DEGRADED MISSION MONITORING CAPABILITY.							

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## MISSION RULES

### SECTION 21 - LM/EMU INSTRUMENTATION - CONTINUED

R	ITEM	SYSTEM	MEAS DESCRIPTION	PCM	ONBOARD	CATEGORY	
		GUIDANCE AND CONTROL (CONTINUED)	RCS TCP B4U	GR5031X	-	HD	
			RCS TCP B4F	GR5033X	-	HD	
			RCS TCP A4R	GR5034X	-	HD	
			RCS TCP A3U	GR5035X	-	HD	
			RCS TCP B3A	GR5037X	-	HD	
			RCS TCP A3R	GR5038X	-	HD	
			RCS TCP B2U	GR5039X	-	HD	
			RCS TCP A2A	GR5041X	-	HD	
			RCS TCP B2L	GR5042X	-	HD	
			RCS TCP A1U	GR5043X	-	HD	
			RCS TCP A1F	GR5045X	-	HD	
			RCS TCP B1L	GR5046X	-	HD	
			YAW ATT ERR	GH1455V	-	FDAI	HD
			PITCH ATT ERR	GH1456V	-	FDAI	HD
			ROLL ATT ERR	GH1457V	-	FDAI	HD
			RGA YAW RATE	GH1461V	-	FDAI	HD
			RGA PITCH RATE	GH1462V	-	FDAI	HD
			RGA ROLL RATE	GH1463V	-	FDAI	HD
			AGS SEL	GH1621X	-	-	HD
			ROLL PLS/DIR	GH1628X	-	-	HD
			PITCH PLS/DIR	GH1629X	-	-	HD
			YAW PLS/DIR	GH1630X	-	-	HD
			AUTO ON	GH1214X	-	-	HD
			APS ARM	GH1230X	-	-	HD
			ENG FIRE OVRD	GH1286X	-	-	HD
		MAN THRUST CMD	GH1311V	-	METER	HD	
		PITCH GDA POS	GH1313V	-	-	HD	
		ROLL GDA POS	GH1314V	-	-	HD	
		P TRM FAIL	GH1323X	-	C&W	HD	
		R TRM FAIL	GH1330X	-	C&W	HD	
		AUTO THRUST CMD	GH1331V	-	METER	HD	
		DPS ARM	GH1348X	-	-	HD	
		DPS VAR ACT	GQ6806H	-	-	HD	
		CES AC PWR FAIL	GL4026X	-	C&W	HD	
		CES DC PWR FAIL	GL4027X	-	C&W	HD	
		AGS DOWNLINK	GI0001X	-	-	HD	
		ASA TEMP	GI3301T	-	-	HD	
		AGS PWR FAIL	GL4028X	-	C&W	HD	
		AUTO OFF	GH1217X	-	-	HD	
		AGS AUTO	GH1641X	-	-	HD	
		AGS ATT HOLD	GH1642X	-	-	HD	
		PGNS AUTO	GH1643X	-	-	HD	
		PGNS ATT HOLD	GH1644X	-	-	HD	
		DESCENT	START TNK PRESS	GQ3015P	HE MON	HD	
		PROPULSION	HE REG PRESS	GQ3018P	C&W	HD	
			HE REG PRESS	GQ3025P	-	-	HD
			HE PRESS	GQ3435P	}	1 OF 2 M	
			HE PRESS	GQ3436P			PRESS
			FU TNK 1 QTY	GQ3603Q	}	1 OF 4 M	
			FU TNK 2 QTY	GQ3604Q			QTY
			OX TNK 1 QTY	GQ4103Q	}	SEE NOTE 2	
			OX TNK 2 QTY	GQ4104Q			QTY
			FU 1 TEMP	GQ3718T	TEMP MON	HD	
			FU 2 TEMP	GQ3719T	TEMP MON	HD	
			OX 1 TEMP	GQ4218T	TEMP MON	HD	
			OX 2 TEMP	GQ4219T	TEMP MON	HD	
			FU PRESS	GQ3611P	}	2 OF 3 M	
			OX PRESS	GQ4111P			
			TCP	GQ6510P			THRUST
		LOW LEVEL	GQ4455X	DPS LOW	HD SEE NOTE 3		

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## MISSION RULES

### SECTION 21 - LM/EMU INSTRUMENTATION - CONCLUDED

R	ITEM	SYSTEM	MEAS DESCRIPTION	PCM	ONBOARD	CATEGORY		
		ASCENT PROPULSION	APS He 1 PRESS	GP0001P	HEL MON C&W	1 OF 2 M		
			APS He LR PRESS	GP0041P		}	PCM	
			APS He 2 PRESS	GP0002P	HEL MON C&W		1 OF 2 M	
			APS He 2R PRESS	GP0042P		}	PCM	
			APS He REG PRESS	GP0018P	C&W		1 OF 2	
			APS He REG PRESS	GP0025P		}	M - PCM	
			APS FUEL TEMP	GP0713T	TEMP		HD	
			APS FUEL LOW	GP0908X	C&W	HD		
			APS OXID TEMP	GP1218T	TEMP	HD		
			APS OXID LOW	GP1408X	C&W	HD		
			APS FUEL PRESS	GP1501P	GP0501P	}	1 OF 2 M	
			APS FUEL PRESS					
			APS OXID PRESS	GP1503P	GP1001P	}	1 OF 2 M	
			APS OXID PRESS					
			VLVS A DELTA POS	GP2997U			HD	
			VLVS B DELTA POS	GP2998U			HD	
			APS TCP	GP2010P			HD	
			REACTION CONTROL	RCS "A" PROP QTY	GR1085Q	QUANTITY	}	1 OF 2 M
				RCS "A" He PRESS	GR1101P			
				RCS "A" REG PRESS	GR1201P	PRESS MON C&W	}	2 OF 3 M
		RCS "A" FUEL MFLD PRESS		GR2201P	PRESS MON			
		RCS "A" OX MFLD PRESS		GR3201P		PRESS MON	}	
		RCS "B" OX MFLD PRESS		GR3202P	PRESS MON			}
		RCS "B" FUEL MFLD PRESS		GR2202P		PRESS MON	}	
		RCS "B" REG PRESS		GR1202P	PRESS MON C&W			}
		RCS "B" PROP QTY		GR1095Q		QUANTITY	}	
		RCS "B" He PRESS		GR1102P	PRESS MON C&W			}
		RCS "A" FUEL TEMP		GR2121T		TEMP MON	}	
		ACS 2 H2O TEMP		GR4586T	TEMP MON			}
		RCS "B" FUEL TEMP		GR2122T		TEMP MON	}	
		ACS 1 H2O TEMP		GR4585T	TEMP MON			}
		RCS MAIN "A" CLSD		GR9609U		MAIN SOV	}	
		RCS MAIN "B" CLSD		GR9610U	MAIN SOV			}
		A/B XFEED OPEN		GR9613P		CRSFD		
		QUAD 1 TEMP		GR6004T	TEMP MON		HD	
		QUAD 2 TEMP		GR6003T	TEMP MON		HD	
		QUAD 3 TEMP		GR6002T	TEMP MON		HD	
		QUAD 4 TEMP	GR6001T	TEMP MON		HD		
		ASC FEED OXID "A" OPEN	GR9641U	SYS A ASC OXID		HD		
		ASC FEED FUEL "A" OPEN	GR9631U	ASC FUEL		HD		
		ASC FEED FUEL "B" OPEN	GR9632U	SYS A ASC OXID		HD		
		ASC FEED OXID "B" OPEN	GR9642U	ASC FUEL		HD		
				SYS B ASC OXID		HD		
				ASC FUEL		HD		

NOTES

1. LOSS OF SEVERAL HD MEASUREMENTS WILL CAUSE SEVERELY DEGRADED MISSION MONITORING CAPABILITY.
2. FOR THE LOSS OF EITHER THE FU OR OX MEASUREMENTS, AN APPROXIMATE 20 SEC HOVER TIME PENALTY IS REALIZED. FOR LOSS OF BOTH SYSTEMS, A PENALTY OF 60 SEC HOVER TIME RESULTS.
3. LOSS OF LO-LEVEL RESULTS IN AN APPROXIMATE 28 SEC HOVER TIME PENALTY.

MISSION	REV	DATE	SECTION	GROUP	PAGE	
APOLLO 17	FNL	9/1/72	LM/EMU INSTRUMENTATION	LM CONTROL	21-6	Tape 61.2

SECTIONS 21 THROUGH 27 ARE DELETED. REFERENCE TELMU AND CONTROL MISSION RULES IN SECTION 3 OF THIS DOCUMENT.

THE LM DETAILED RULES WERE DELETED TO ELIMINATE DUPLICATION BETWEEN THEM AND THE SUMMARY RULES IN SECTION 3.

IN SOME CASES, THE SUMMARY RULES HAVE BEEN EXPANDED TO INCLUDE DATA PREVIOUSLY COVERED ONLY IN THE DETAILED RULES.

<del>21 LM SEQUENTIAL AND PYROTECHNIC</del>
<del>22 LM ELECTRICAL POWER</del>
<del>23 LM ENVIRONMENTAL CONTROL</del>
<del>24 LM GUIDANCE AND CONTROL</del>
<del>25 LM DFS</del>
<del>26 LM APS</del>
<del>27 LM REACTION CONTROL SYSTEM</del>

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## MISSION RULES

### SECTION 28 - SPACE ENVIRONMENT

R	ITEM							
		<u>GENERAL</u>						
	28-1	ALL DECISIONS WILL BE BASED ON CONFIRMED MEASUREMENTS AND/OR EVENTS AND PROJECTIONS BASED ON CONFIRMED EVENTS.						
	28-2	<p><u>DEFINITIONS</u></p> <p>A. THE MAXIMUM OPERATIONAL DOSE (MOD) IS THE MAXIMUM RADIATION DOSE TO WHICH THE CREW WOULD BE SUBJECTED BASED ON A SKIN DOSE OF 400 RAD AND/OR A DEPTH (GASTROINTESTINAL) DOSE OF 50 RAD.</p> <p>B. THE PLANNING OPERATIONAL DOSE (POD) IS THE MAXIMUM RADIATION DOSE TO THE CREW FOR WHICH ANY MISSION WOULD BE DESIGNED DURING THE PLANNING PERIOD BASED ON AN ASSUMED SKIN DOSE OF 250 RAD AND/OR A DEPTH DOSE OF 25 RAD.</p> <p>C. THESE DOSES REPRESENT THE CUTOFF POINT WHERE A DECISION MUST BE MADE WHETHER TO CONTINUE OR TERMINATE THE MISSION.</p> <p>D. THE RADIATION ABSORBED DOSE (RAD) IS A UNIT OF ABSORBED DOSE WHICH IS EQUAL TO AN ENERGY DEPOSITION OF 100 ERGS/GRAM.</p> <p>E. THE RELATIVE BIOLOGICAL EFFECTIVENESS (RBE) EXPRESSES THE EFFECTIVENESS OF PARTICULAR TYPES OF RADIATION IN PRODUCING THE SAME BIOLOGICAL RESPONSE.</p> <p>THE AVERAGE RBE THAT WILL BE USED FOR SOLAR PARTICLE EVENT RADIATION FROM PROTONS IS 1.2.</p> <p>F. THE ROENTGEN EQUIVALENT MAN (REM) IS THE PRODUCT OF THE RAD AND THE RBE (REM = RAD X RBE).</p> <p>G. A CONFIRMED EVENT IS DEFINED AS AN EVENT THAT HAS BEEN MEASURED BY TWO OR MORE INDEPENDENT SOURCES.</p> <p>H. A SIGNIFICANT INCREASE OF THE MOD WILL BE DEFINED BY THE FLIGHT SURGEON IN REAL TIME BASED ON THE CHARACTER AND ACCURACY OF THE DATA AT THE TIME.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SPACE ENVIRONMENT	GENERAL	28-1	Tape 28.1

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 28 - SPACE ENVIRONMENT - CONTINUED

R	ITEM							
		<u>MANAGEMENT</u>						
	28-3	THE EXISTING AND PROJECTED RADIATION ENVIRONMENT WILL BE A PART OF THE GO/NO-GO DECISION PROCESS.						
	28-4	<u>PRIORITY OF DATA</u>						
		A. NATURAL (SOLAR PARTICLE EVENT)						
		1. PRELAUNCH AND EPO						
		(A) SOLAR PARTICLE ALERT NETWORK (SPAN)						
		(B) VELA NATURAL RADIATION SATELLITE						
		(C) PIONEER RADIATION SATELLITE						
		(D) EXPLORER RADIATION SATELLITE						
		(E) SOLAR PARTICLE MONITORING SYSTEM (SPMS)						
		2. ALL OTHER PHASES						
		(A) S/C INSTRUMENTATION						
		(1) VAN ALLEN BELT DOSIMETER (VABD)						
		(2) PERSONAL RADIATION DOSIMETER (PRD)						
		(3) NUCLEAR PARTICLE DETECTION SYSTEM (NPDS)						
		(B) SOLAR PARTICLE ALERT NETWORK (SPAN)						
		(C) VELA NATURAL RADIATION SATELLITE						
		(D) PIONEER RADIATION SATELLITE						
		(E) EXPLORER RADIATION SATELLITE						
		(F) SOLAR PARTICLE MONITORING SYSTEM (SPMS)						
		B. ARTIFICIAL						
		1. ALL PHASES EXCEPT EPO						
		(A) JAEIC						
		(B) RIOMETER						
		2. EPO						
		(A) JAEIC						
		(B) RIOMETER						
		(C) PRD						
		3. EARTH ORBITAL MISSION						
		(A) PRD						
		(B) JAEIC						
		(C) RIOMETER						
		RULE NUMBERS 28-5 THROUGH 28-9 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SPACE ENVIRONMENT	MANAGEMENT	28-2	Tape 28.2

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MISSION RULES

SECTION 28 - SPACE ENVIRONMENT - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				<u>SPECIFIC MISSION RULES</u>				
	28-10	ANY SOURCE REPORTS A POSSIBLE ARTIFICIAL EVENT	ALL	PROCEED UNTIL VERIFICATION FROM ALL OTHER SOURCES.				
	28-11	DEFINITE ARTIFICIAL EVENT CONFIRMED BY REPORTING SOURCES	PRELAUNCH	A. HOLD UNTIL INFORMATION FROM REPORTING SOURCES INDICATES THE MOD WILL NOT BE EXCEEDED.	B.1. CREW SHOULD BEGIN PERSONAL DOSIMETER READOUTS PER FCOH SOP 2.8.			
EPO			B.1. CONTINUE MISSION UNLESS DATA ANALYSIS INDICATES THAT THE DOSE PROJECTED THROUGH TLI WILL EXCEED THE MOD BY A SIGNIFICANT AMOUNT. IF THE MOD WILL BE EXCEEDED BY A SIGNIFICANT AMOUNT, PERFORM A LOW EARTH ORBIT ALTERNATE MISSION.  2. FOR DOSES APPROACHING THE MOD CONTINUE MISSION WITH CONTINUOUS PRD MONITORING AND CREW ASSESSMENT. CONSIDERATION WILL BE GIVEN TO CHANGING THE TRAJECTORY TO A LOW EARTH ORBIT OR REENTERING ASAP BASED ON ACTUAL					
ALL OTHER			C. CONTINUE MISSION					
	28-12	RADIATION CONFIRMED BY PRD READOUTS OR ONBOARD TM AND PROJECTED TO EXCEED THE MOD	ALL	<u>REENTER NEXT BEST PTP</u>	ALSO APPLIES TO ALTERNATE EARTH ORBIT MISSION.			
	28-13	MAJOR SOLAR FLARE PREDICTED	ALL	<u>CONTINUE MISSION</u>				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SPACE ENVIRONMENT	SPECIFIC	28-3	Tape 28.3

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MISSION RULES

SECTION 28 - SPACE ENVIRONMENT - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	28-14	<p>MAJOR SOLAR FLARE HAS OCCURRED</p> <p>A. UNCONFIRMED PARTICLE EVENT</p> <p>B. CONFIRMED PARTICLE EVENT AND SOLAR PARTICLE ALERT NETWORK/RTACF ANALYSIS INDICATES THE MOD WILL BE EXCEEDED DURING THE MISSION</p> <p>C. CONFIRMED PARTICLE EVENT AND S/C TM OR PRD READOUT PROJECTIONS INDICATE THE MOD WILL BE EXCEEDED DURING THE MISSION</p>	<p>ALL</p> <p>PRELAUNCH</p> <p>EPO</p> <p>ALL OTHERS</p> <p>TLC</p> <p>LO</p> <p>LUNAR STAY</p> <p>ALL OTHER PHASES</p>	<p>A. <u>CONTINUE MISSION</u></p> <p>B.1. HOLD UNTIL DATA ANALYSIS INDICATES THAT THE MOD WILL NOT BE EXCEEDED.</p> <p>2. <u>CONTINUE MISSION</u></p> <p>IF DATA ANALYSIS INDICATES THAT THE MOD WILL BE EXCEEDED BY A SIGNIFICANT AMOUNT PRIOR TO MISSION COMPLETION, TLI IS NO-GO.</p> <p>3. <u>CONTINUE MISSION</u></p> <p>CONSIDERATION WILL BE GIVEN TO EARLY (OR EXTENDED) TEI AND INHIBITING CREW TRANSFER TO LM.</p> <p>C.1. <u>CONTINUE MISSION</u></p> <p>CONSIDERATION SHOULD BE GIVEN TO ENTERING NEXT BEST PTP IF THE TOTAL DOSE CAN BE REDUCED SIGNIFICANTLY WITHOUT INCREASING THE TOTAL RISK TO THE CREW.</p> <p>2. <u>CONTINUE MISSION</u></p> <p>CONSIDER EXTENDING LUNAR ORBIT STAY TIME IF THE TOTAL DOSE TO THE CREW WOULD BE REDUCED SIGNIFICANTLY BY LUNAR SHIELDING.</p> <p>3. CONSIDER REDUCING THE LUNAR STAY TIME AND/OR EVA IF THE TOTAL DOSE TO THE CREW CAN BE REDUCED SIGNIFICANTLY WITHOUT INCREASING THE TOTAL RISK TO THE CREW.</p> <p>4. <u>CONTINUE MISSION</u></p>	<p>C.1. CREW SHOULD BEGIN PERSONAL DOSIMETER AND RADIATION SURVEY METER READOUTS PER FCOH SOP 2.8.</p> <p>2.(A) HATCH-DOWN ATTITUDE MAY BE USED TO REDUCE THE TOTAL DOSE.</p> <p>(B) IF A PARTICLE EVENT IS CONFIRMED, THE CREW WILL TRANSFER FROM THE LM TO THE CSM ASAP.</p>			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	SPACE ENVIRONMENT	SPECIFIC	28-4	Tape 28.4

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MISSION RULES

SECTION 28 - SPACE ENVIRONMENT - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS					
	28-15	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MSN RULE REF
		RADIATION DOSIMETER 1 (CM DEPTH DOSE RATE)	CK1051K	-	-	HD	28-12
		VABD					
		RADIATION DOSIMETER 2 (CM SKIN DOSE RATE)	CK1052K	-	-	HD	28-12
		DOSIMETER RATE CHANGE	CK1053R	-	-	HD	28-12
		NPDS					
		PROTON COUNT RATE CHAN 1	ST0820K	-	-	HD	28-14
		PROTON COUNT RATE CHAN 2	ST0821K	-	-	HD	28-14
		PROTON COUNT RATE CHAN 3	ST0822K	-	-	HD	28-14
		PROTON COUNT RATE CHAN 4	ST0823K	-	-	HD	28-14
		ALPHA COUNT RATE CHAN 1	ST0830K	-	-	HD	28-14
		ALPHA COUNT RATE CHAN 2	ST0831K	-	-	HD	28-14
		ALPHA COUNT RATE CHAN 3	ST0832K	-	-	HD	28-14
		PROTON INTEGER COUNT RATE	ST0838K	-	-	HD	28-14
		TEMP NUCLEAR PART. DET	ST0840T	-	-	HD	28-14
		TEMP NUCLEAR PART. ANAL	ST0841T	-	-	HD	28-14
		PERSONAL RADIATION DOSIMETER (PRD)	-	3 ONBOARD		MANDATORY TO BE ONBOARD	28-14
		RATE SURVEY METER (RSM)	-	1 ONBOARD		MANDATORY TO BE ONBOARD	28-14

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## MISSION RULES

### SECTION 29 - RECOVERY

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS															
				<u>SPECIFIC</u>																
	29-1	ACCEPTABLE WEATHER CONDITIONS AND RECOVERY CAPABILITY* IN THE LAUNCH SITE AREA	PRELAUNCH	MANDATORY																
	29-2	ACCEPTABLE WEATHER CONDITIONS AND RECOVERY CAPABILITY* IN THE LAUNCH ABORT AREA TO 1000 NM DOWNRANGE AND IN THE MIDPACIFIC RECOVERY ZONE	PRELAUNCH	HIGHLY DESIRABLE																
	29-3	MINIMUM OF 71 AMP-HOURS OF CM POSTLANDING POWER AVAILABLE AT LANDING		HIGHLY DESIRABLE	TO PROVIDE 40 HOURS OF CM POSTLANDING POWER PLUS ONE UPRIGHTING.															
	29-4	MINIMUM OF 35 AMP-HOURS OF CM POSTLANDING POWER AVAILABLE AT LANDING		MANDATORY	TO PROVIDE 18 HOURS OF CM POSTLANDING POWER PLUS ONE UPRIGHTING															
	29-5	UNTIL ENTRY MINUS 24 HOURS, RETAIN ΔV CAPABILITY TO MOVE ENTRY POINT ±500 NM		HIGHLY DESIRABLE	TO PROVIDE WEATHER AVOIDANCE CAPABILITY.															
<p>*RECOVERY CAPABILITY WILL BE BASED PRIMARILY UPON THE LOCAL RECOVERY UNIT COMMANDER'S EVALUATION OF HIS CAPABILITY TO PERFORM THE RECOVERY OPERATION. WEATHER CONDITIONS AT THE TIME OF CM LANDING AFFECT BOTH RECOVERY CAPABILITY AND STRUCTURAL INTEGRITY OF THE CM. THE FOLLOWING GUIDELINES ARE USED TO INDICATE WHEN IT MAY BE NECESSARY TO RE-EVALUATE:</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;">WORLD WIDE</th> <th style="text-align: center;">LAUNCH SITE</th> </tr> </thead> <tbody> <tr> <td>SURFACE WINDS</td> <td style="text-align: center;">25 KNOTS</td> <td style="text-align: center;">25 KNOTS</td> </tr> <tr> <td>CEILING</td> <td style="text-align: center;">1500 FT</td> <td style="text-align: center;">500 FT</td> </tr> <tr> <td>VISIBILITY</td> <td style="text-align: center;">3 NM</td> <td style="text-align: center;">1/2 NM</td> </tr> <tr> <td>WAVE HEIGHT</td> <td style="text-align: center;">8 FT</td> <td style="text-align: center;">8 FT</td> </tr> </tbody> </table>							WORLD WIDE	LAUNCH SITE	SURFACE WINDS	25 KNOTS	25 KNOTS	CEILING	1500 FT	500 FT	VISIBILITY	3 NM	1/2 NM	WAVE HEIGHT	8 FT	8 FT
	WORLD WIDE	LAUNCH SITE																		
SURFACE WINDS	25 KNOTS	25 KNOTS																		
CEILING	1500 FT	500 FT																		
VISIBILITY	3 NM	1/2 NM																		
WAVE HEIGHT	8 FT	8 FT																		
			MISSION	REV	DATE	SECTION	GROUP	PAGE												
			APOLLO 17	FNL	9/1/72	RECOVERY	SPECIFIC	29-1	Tape 29.3											

NASA - Manned Spacecraft Center

MISSION RULES

SECTION 29 - RECOVERY - CONCLUDED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	29-6	AN ELLIPSE 163 NM UPRANGE, 152 NM DOWNRANGE AND 50 NM TO EITHER SIDE OF 55 DEG/55 DEG TARGET POINT, AND AN ELLIPSE 105 NM UPRANGE AND DOWNRANGE AND 40 NM TO EITHER SIDE OF THE ROLL RIGHT 90 DEG (DELAYED) TARGET POINT WILL BE CLEAR OF ALL LAND.	EARTH ORBITAL	MANDATORY				
	29-7	REMAINDER OF MANEUVER FOOTPRINT AND AN ELLIPSE 139 NM UPRANGE AND DOWNRANGE AND 40 NM TO EITHER SIDE OF 90 DEG/90 DEG TARGET POINT, AND AN ELLIPSE 105 NM UPRANGE AND DOWNRANGE AND 40 NM TO EITHER SIDE OF ROLL RIGHT 90 DEG TARGET POINT WILL BE CLEAR OF LARGE LAND MASSES.	EARTH ORBITAL	HIGHLY DESIRABLE				
	29-8	A 5 NM RADIUS CIRCLE CENTERED ON THE GNCS TARGET POINT AND AN ELLIPSE 26 NM UPRANGE, 26 NM DOWNRANGE AND 52 NM EITHER SIDE OF THE EMS TARGET POINT WILL BE CLEAR OF ALL LAND.	POST-TLI	MANDATORY				
	29-9	REMAINDER OF OPERATIONAL FOOTPRINT (SEE RULE 1-40) WILL BE CLEAR OF LARGE LAND MASSES	POST-TLI	HIGHLY DESIRABLE				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	RECOVERY	SPECIFIC	29-2	Tape 29.4

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 30 - AEROMEDICAL

R	ITEM	GENERAL						
30-1	<u>PRELAUNCH</u>	<p>PRIOR TO COMMITTING TO LAUNCH, THE FOLLOWING CONDITIONS MUST BE MET:</p> <p>A. SATISFACTORY FLIGHT CREW PHYSIOLOGICAL STATUS.                      B. THE MINIMUM CABIN OXYGEN CONCENTRATION FOR LAUNCH IS 60 PERCENT.                      C. THE MINIMUM SUIT OXYGEN CONCENTRATION FOR LAUNCH IS 95 PERCENT.</p>						
30-2		THE SUIT CIRCUIT MUST BE MAINTAINED AT LEAST 2 INCHES OF WATER PRESSURE ABOVE THE CABIN PRESSURE. SUIT LOOP PURGE IS REQUIRED IF THE SUIT-TO-CABIN DELTA PRESSURE REMAINS AT ZERO FOR A PERIOD OF 5 MINUTES.						
30-3		THE POTABLE WATER PH MUST BE WITHIN 6.0 TO 8.0 AT SERVICING AND FINAL SAMPLING.						
30-4		THE MAXIMUM ALLOWABLE CONCENTRATION OF PCO <sub>2</sub> IS 5 MM OF Hg.						
30-5	<u>LAUNCH</u>	THERE ARE NO MEDICAL REASONS FOR ABORTING DURING THE LAUNCH PHASE OTHER THAN THOSE CONDITIONS INTOLERABLE TO THE CREW.						
30-6	<u>EARTH ORBIT AND DEEP SPACE OPERATIONS</u>	<p>EARLY MISSION TERMINATION FOR MEDICAL REASONS FALLS INTO TWO CATEGORIES:</p> <p>A. ONSET OF CONDITIONS WHICH ADVERSELY AFFECT CREW SAFETY, OR FUNCTION AND PERFORMANCE                      B. FAILURE OF SPACECRAFT SYSTEMS TO MAINTAIN A PHYSIOLOGICALLY SATISFACTORY ENVIRONMENT</p>						
30-7	<u>WATER PALATABILITY</u>	<p>CREW EVALUATION OF THE DRINKING WATER TASTE WILL BE THE BASIS FOR DETERMINING WATER PALATABILITY, EVEN FOR KOH CONTAMINATION.</p> <p>RULE NUMBERS 30-8 THROUGH 30-14 ARE RESERVED.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	AEROMEDICAL	GENERAL	30-1	Tape 29.5

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MISSION RULES

SECTION 30 - AEROMEDICAL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				SPECIFIC MISSION RULES				
	30-15	LOSS OF OR UNREADABLE EKG	ALL PHASES  EVA	A. <u>CONTINUE MISSION</u>  B. <u>CONTINUE MISSION</u>	A. ARTIFACTS ANTICIPATED DURING LAUNCH. MCC SURGEON WILL EVALUATE THE PROBLEM AND MAY RECOMMEND EARLY MISSION TERMINATION IF CORRECTIVE ACTION IS NOT EFFECTIVE.  B. MCC SURGEON WILL EVALUATE PROBLEM AND RECOMMEND CORRECTIVE ACTION. IF NOT EFFECTIVE, CEVA MAY BE RECOMMENDED.			
	30-16	ABNORMAL HEART RATE, RHYTHM, OR EKG	LAUNCH EPO TLC LO EVA TEC	A. <u>CONTINUE MISSION</u> B. <u>NO-GO FOR TLI</u> C. <u>NO-GO FOR LOI</u> D. <u>ENTER NEXT BEST PTP</u> E. <u>TERMINATE EVA</u> F. <u>ENTER NEXT BEST PTP</u>	MCC SURGEON WILL EVALUATE THE PROBLEM AND MAY RECOMMEND EARLY MISSION TERMINATION IF CORRECTIVE ACTION IS NOT EFFECTIVE.			
	30-17	ABNORMAL RESPIRATORY RATE	LAUNCH EPO TLC LO TEC	A. <u>CONTINUE MISSION</u> B. <u>NO-GO FOR TLI</u> C. <u>NO-GO FOR LOI</u> D. <u>ENTER NEXT BEST PTP</u> E. <u>ENTER NEXT BEST PTP</u>	THE ABNORMAL RATES WILL BE EVALUATED BY THE MCC SURGEON AND EARLY MISSION TERMINATION MAY BE RECOMMENDED IF CORRECTIVE ACTION IS NOT EFFECTIVE.			
	30-18	ONSET OF SERIOUS MEDICAL PROBLEM	LAUNCH  EPO TLC LO EVA TEC	A. <u>CONTINUE MISSION</u> CREW MAY ELECT TO ABORT IF INTOLERABLE B. <u>ENTER NEXT BEST PTP</u> C. <u>ENTER NEXT BEST PTP</u> D. <u>ENTER NEXT BEST PTP</u> E. <u>TERMINATE EVA</u> F. <u>ENTER NEXT BEST PTP</u>	MCC SURGEON WILL EVALUATE THE PROBLEM AND MAY RECOMMEND EARLY MISSION TERMINATION IF CORRECTIVE ACTION IS NOT EFFECTIVE.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	AEROMEDICAL	SPECIFIC PHYSIOLOGICAL	30-2	Tape 29.6



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MISSION RULES

SECTION 30 - AEROMEDICAL - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
30-25	INCREASE IN PCO2	A. IS GREATER THAN OR EQUAL TO 7.6 MM Hg	LAUNCH	A.1. <u>CONTINUE MISSION</u>	A. PCO2 SHOULD DECREASE BELOW 2 MM Hg WITHIN 30 MINUTES.			
			ALL	2. <u>CONTINUE MISSION</u> CHANGE L10H CANISTER				
		B. GREATER THAN OR EQUAL TO 7.6 MM Hg AND UNABLE TO DECREASE	LAUNCH	B.1. <u>CONTINUE MISSION</u>	B.2. L10H CANISTERS MAY BE CHANGED IN AN UNPRESSURIZED CABIN.  B.2. (C) PCO2 SENSOR TEST:  PURGE PCO2 SENSOR WITH DIRECT O2 VALVE OPEN FOR 10 SEC (REF ECS MALF NO. 12).  IF ABOVE PROCEDURE RESULTS IN A PCO2 READING NEAR ZERO, THE PCO2 SENSOR IS OPERATING PROPERLY.			
ALL	2. <u>CONTINUE MISSION</u> (A) OPEN SUITS AND BREATHE FROM CABIN (B) CHANGE SECOND L10H CANISTER (C) TEST PCO2 SENSOR							
C. GREATER THAN OR EQUAL TO 10 MM Hg	LAUNCH	C.1. <u>CONTINUE MISSION</u>						
			ALL	2. <u>TERMINATE PHASE</u> ENTER NEXT BEST PTP	C.2. PLSS ACCEPTABLE CO2 LEVEL IS 15 MM Hg (REFERENCE EVA MISSION RULES CHART)			
30-26	PCO2 INSTRUMENTATION FAILURE		ALL	<u>CONTINUE MISSION</u>				
		RULE NUMBERS 30-27 THROUGH 30-34 ARE RESERVED.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	AEROMEDICAL	SPECIFIC EQUIPMENT	30-4	Tape 44.7

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## MISSION RULES

SECTION 30 - AEROMEDICAL - CONCLUDED

R	ITEM	INSTRUMENTATION REQUIREMENTS						
	30-35	<u>MEAS DESCRIPTION</u>	<u>PCM</u>	<u>ONBOARD</u>	<u>TRANSDUCERS</u>	<u>CATEGORY</u>	<u>MSN RULE REFERENCE</u>	
		<u>CSM</u>						
		ELECTROCARDIOGRAM	CJ0060J	NOT DISPLAYED		M*	30-15,16	
		ELECTROCARDIOGRAM	CJ0061J	NOT DISPLAYED		M*	30-15,16	
		ELECTROCARDIOGRAM	CJ0062J	NOT DISPLAYED		M*	30-15,16	
		CO2 PARTIAL PRESSURE	CF0005P	METER	COMMON	HD	30-2,27,28	
		SUIT CABIN DELTA PRESS	CF0003P	NOT DISPLAYED		HD	30-3,19	
		ORAL TEMPERATURE		CLINICAL THERMOMETER		M	30-20	
		PNEUMOGRAM	CJ0200P	NOT DISPLAYED		HD	30-17	
		PNEUMOGRAM	CJ0201P	NOT DISPLAYED		HD	30-17	
		PNEUMOGRAM	CJ0202P	NOT DISPLAYED		HD	30-17	
		<u>LM</u>						
		CO2 PARTIAL PRESSURE	GF1521P	METER		HD		
		ELECTROCARDIOGRAM	GT9999	NOT DISPLAYED		M**	30-15,16	
		PNEUMOGRAM		NOT DISPLAYED		HD	30-17	
		<u>PLSS</u>						
		PLSS ELECTROCARDIOGRAM	GT8124J			M**	30-15,16	
			GT8224J			M**	30-15,16	
		*MANDATORY UNTIL SUIT ROOM DEPARTURE.						
		**MANDATORY UNTIL LM CLOSEOUT.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	AEROMEDICAL	INSTR REQ	30-5	
								Tape 43A.7

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MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS

R	ITEM							
		<u>CONSTRAINTS AND OPTIONS</u>						
	31-1	<p>LRV MOBILITY RATES WILL BE DETERMINED IN REAL TIME. THESE RATES WILL BE PROJECTED FOR MAINTAINING THE EFFECTIVE OPERATIONAL ENVELOPE AND REASSESSING THE TRAVERSE PLAN. THE PROJECTED RATES MAY BE ADJUSTED UPWARD OR DOWNWARD FROM COMPUTED RATES BASED ON QUALITATIVE JUDGEMENT OF:</p> <ul style="list-style-type: none"> <li>A. TERRAIN DIFFERENCES</li> <li>B. LOSSES IN DRIVING TIME ATTRIBUTABLE TO SURFACE OBSERVATIONS</li> <li>C. UNSCHEDULED STOPS</li> </ul> <p>RULE NUMBERS 31-2 THROUGH 31-30 ARE RESERVED</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	CONSTRAINTS AND OPTIONS	31-1	Tape 43A.9

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MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	ITEM																																										
	<u>PRECEDENCE/SCHEDULING</u>																																										
31-31	<p>IN ESTABLISHING THE SURFACE EXPLORATION PLAN, THE TRAVERSE PLANS PREPARED BEFORE LAUNCH WILL BE USED AS BASELINES AND MODIFIED AS NECESSARY TO ACCOMMODATE THE ACTUAL LANDING POINT, RADIUS OF OPERATIONS, TIMELINE AND MOBILITY CONSTRAINTS, AND LUNAR SURFACE HARDWARE CAPABILITY TO REACH THE SE SELENOLOGICAL FEATURES. THE MINIMUM TIME REQUIRED FOR EACH REGION ARE INCLUDED:</p> <table style="margin-left: 40px;"> <tr> <td>A. SOUTH MASSIF</td> <td><u>TBD</u></td> <td>MINIMUM TIME</td> </tr> <tr> <td>B. NORTH MASSIF</td> <td><u>TBD</u></td> <td>MINIMUM TIME</td> </tr> <tr> <td>C. DARK MANTLE</td> <td><u>TBD</u></td> <td>MINIMUM TIME</td> </tr> <tr> <td>D. LIGHT MANTLE</td> <td><u>TBD</u></td> <td>MINIMUM TIME</td> </tr> </table>	A. SOUTH MASSIF	<u>TBD</u>	MINIMUM TIME	B. NORTH MASSIF	<u>TBD</u>	MINIMUM TIME	C. DARK MANTLE	<u>TBD</u>	MINIMUM TIME	D. LIGHT MANTLE	<u>TBD</u>	MINIMUM TIME																														
A. SOUTH MASSIF	<u>TBD</u>	MINIMUM TIME																																									
B. NORTH MASSIF	<u>TBD</u>	MINIMUM TIME																																									
C. DARK MANTLE	<u>TBD</u>	MINIMUM TIME																																									
D. LIGHT MANTLE	<u>TBD</u>	MINIMUM TIME																																									
31-32	<p>FOR SITUATIONS WHERE ALL SURFACE TASKS CANNOT BE ACCOMPLISHED, THE FOLLOWING ORDER OF PRECEDENCE WILL BE USED IN MAKING STATION/TASK TRADE-OFFS.</p> <table style="margin-left: 40px; border-collapse: collapse;"> <thead> <tr> <th colspan="2"><u>EVA 1</u></th> <th colspan="2"><u>EVA 2</u></th> <th colspan="2"><u>EVA 3</u></th> </tr> <tr> <th>STATION</th> <th>PRIORITY</th> <th>STATION</th> <th>PRIORITY</th> <th>STATION</th> <th>PRIORITY</th> </tr> </thead> <tbody> <tr> <td>ALSEP</td> <td>1</td> <td>2</td> <td>1</td> <td>6 }</td> <td>1</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>2</td> <td>7 }</td> <td></td> </tr> <tr> <td></td> <td></td> <td>4</td> <td>3</td> <td>8</td> <td>2</td> </tr> <tr> <td></td> <td></td> <td>5</td> <td>4</td> <td>10</td> <td>3</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>9</td> <td>4</td> </tr> </tbody> </table>	<u>EVA 1</u>		<u>EVA 2</u>		<u>EVA 3</u>		STATION	PRIORITY	STATION	PRIORITY	STATION	PRIORITY	ALSEP	1	2	1	6 }	1	1	2	3	2	7 }				4	3	8	2			5	4	10	3					9	4
<u>EVA 1</u>		<u>EVA 2</u>		<u>EVA 3</u>																																							
STATION	PRIORITY	STATION	PRIORITY	STATION	PRIORITY																																						
ALSEP	1	2	1	6 }	1																																						
1	2	3	2	7 }																																							
		4	3	8	2																																						
		5	4	10	3																																						
				9	4																																						
31-33	<p>REASSESSMENT OF THE OPERATIONAL EVA PLAN WILL BE DONE IF ANY OF THE FOLLOWING CONDITIONS EXIST:</p> <ul style="list-style-type: none"> <li>A. BEHIND TIMELINE BY MORE THAN 10 PERCENT OF EVA TIME REMAINING</li> <li>B. AHEAD OF TIMELINE BY MORE THAN 15 MINUTES</li> <li>C. DEGRADATION OF THE LRV TO SUCH AN EXTENT THAT A MINIMUM OF 4 KM/HR VEHICLE SPEED CANNOT BE MAINTAINED OR THE PLANNED TRAVERSE VIOLATES THE REDEFINED OPERATIONAL ENVELOPE</li> </ul>																																										
31-34	<p>IF A REALIGNMENT OF THE TRAVERSE IS REQUIRED, EITHER BY EXTENSIONS OR REDUCTIONS, THE REVISION WILL NORMALLY BE PASSED TO THE CREW AS EVA PAD UPDATES AT APPROXIMATELY THE 1/3 AND 2/3 EVA COMPLETION POINTS.</p>																																										
31-35	<p>TOTAL DRIVING TIME FROM THE LM TO STATION 2 WILL BE LIMITED TO 1 HOUR. DEPARTURE TIME FROM STATION 2 WILL BE LIMITED TO 2 HOURS AND 50 MIN TO MAINTAIN MARGINS FOR STATION 3 AND 4 WALKBACK.</p>																																										
	<p>31-36 THROUGH 31-50 ARE RESERVED.</p>																																										
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">MISSION</td> <td style="width: 10%;">REV</td> <td style="width: 15%;">DATE</td> <td style="width: 20%;">SECTION</td> <td style="width: 15%;">GROUP</td> <td style="width: 15%;">PAGE</td> </tr> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>LUNAR SURFACE OPS</td> <td>PRECEDENCE/SCHEDULING</td> <td>31-2</td> </tr> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE	APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	PRECEDENCE/SCHEDULING	31-2																														
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APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	PRECEDENCE/SCHEDULING	31-2																																						
	Tape 56.1																																										

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	ITEM	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 80%;"> <p style="text-align: center; margin: 0;"><u>SYSTEMS MANAGEMENT</u></p> </div>																	
31-51		THE LRV RADIATOR COVERS WILL BE DUSTED BEFORE OPENING. THE RADIATOR SURFACES WILL BE DUSTED EACH TIME THE COVERS ARE OPENED WITH RADIATORS IN THE SUN.																	
31-52		THE AUXILIARY PWR BYPASS SWITCH WILL BE PUT IN THE ON POSITION ONLY AFTER EVA 3.																	
31-53		THE DRIVE ENABLE SWITCHES WILL NOT BE OPERATED AFTER INITIAL CONFIGURATION EXCEPT AS REQUIRED FOR FAILURES OR MALFUNCTION ISOLATION.																	
31-54		<p>LRV PARKING CONSTRAINTS FOR LRV AND PAYLOAD THERMAL CONSIDERATIONS ARE AS FOLLOWS:</p> <p>A. THE LRV WILL BE PARKED A MINIMUM OF <u>20</u> FT FROM THE NEAREST LM SIDE.</p> <p>B. <u>PARKING DURATION</u>                      <u>REQUIRED SUN AZIMUTH</u>                      <u>CRITICAL ITEM</u></p> <p>LESS THAN:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">6 HRS IN SUN</td> <td style="width: 30%;">ANY</td> <td style="width: 40%;">N/A</td> </tr> <tr> <td>2 HRS IN SHADE</td> <td>ANY</td> <td>N/A</td> </tr> </table> <p>MORE THAN:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">6 HRS IN SUN</td> <td style="width: 30%;">80°-110° CCW FROM UPSUN*</td> <td style="width: 40%;">LCRU, C&amp;D CONSOLE</td> </tr> <tr> <td>2 HRS IN SHADE</td> <td>NOT RECOMMENDED</td> <td>C&amp;D CONSOLE LRV NAVIGATION LCRU</td> </tr> </table> <p>*FOR BETWEEN EVA'S PARKING, THE LRV NAVIGATION HEADING WILL BE USED TO PARK THE LRV 85° CCW FROM UPSUN. HEADING WILL BE SPECIFIED BY MCC BASED ON SUN AZIMUTH.</p>						6 HRS IN SUN	ANY	N/A	2 HRS IN SHADE	ANY	N/A	6 HRS IN SUN	80°-110° CCW FROM UPSUN*	LCRU, C&D CONSOLE	2 HRS IN SHADE	NOT RECOMMENDED	C&D CONSOLE LRV NAVIGATION LCRU
6 HRS IN SUN	ANY	N/A																	
2 HRS IN SHADE	ANY	N/A																	
6 HRS IN SUN	80°-110° CCW FROM UPSUN*	LCRU, C&D CONSOLE																	
2 HRS IN SHADE	NOT RECOMMENDED	C&D CONSOLE LRV NAVIGATION LCRU																	
31-55		<p>LRV BATTERY POWER/THERMAL MANAGEMENT WILL BE ACCOMPLISHED THROUGH CONFIGURATION OF THE BATTERY LOADS, LIMITING USE OF NON-CRITICAL SYSTEMS AND BY OPENING THE BATTERY COVERS WHILE PARKING UPSUN AT TRAVERSE STOPS GREATER THAN 30 MIN. THE CONDITIONS TO BE MAINTAINED THROUGH THIS MANAGEMENT IN ORDER OF PRIORITY ARE:</p> <p>A. BATTERIES SHALL BE MAINTAINED IN TEMPERATURE RANGE OF:</p> <ol style="list-style-type: none"> <li>1. 40° F - 125° F FOR EVA 1 AND 2</li> <li>2. 40° F - 140° F FOR EVA 3</li> </ol> <p>B. RELATIVE STATE-OF-CHARGE BETWEEN BATTERIES BALANCED TO WITHIN 20 AMP-HOURS</p>																	
		MISSION	REV	DATE	SECTION	GROUP	PAGE												
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	LRV MANAGEMENT	31-3												
							Tape 52.12												

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MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	ITEM
31-56	LRV BATTERY COVERS WILL BE OPENED DURING EVA/LRV CLOSEOUT AT THE LM.
31-57	DELETED
31-58	THE LRV MUST REMAIN STATIONARY FOR 1 MINUTE 30 SECONDS FOLLOWING NAVIGATION SYSTEM TURN-ON TO ALLOW THE DIRECTIONAL GYRO UNIT (DGU) TO ATTAIN OPERATING SPEED. DURING THIS WARM-UP PERIOD THE GYRO TORQUING SWITCH MAY NOT BE OPERATED. USE OF THE SYSTEM RESET SWITCH IS NOT CONSTRAINED BY THIS RULE.
31-59	THE LRV DGU WILL BE ALIGNED BEFORE DEPARTURE FROM THE LM ON EACH EVA. THE DGU WILL BE CHECKED AT DESIGNATED POINTS ON THE TRAVERSE. IT WILL BE TORQUED TO REALIGN IF IT HAS DRIFTED >2 DEGREES.

MISSION	REV	DATE	SECTION	GROUP	PAGE
APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	LRV MANAGEMENT	31-4

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MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				<u>SPECIFIC</u>				
	31-60	RESERVED						
	31-61	FORWARD OR REAR STEERING UNIT FAILS TO RESPOND TO HAND-CONTROLLER COMMAND		ELECTRICALLY DISABLE THE FAILED STEERING UNIT.	MAY EVENTUALLY REQUIRE PINNING IF UNPOWERED STEERING WANDERS EXCESSIVELY.			
	31-62	FORWARD OR REAR STEERING UNIT DRIVE HARDOVER WITH HAND CONTROLLER IN NEAR CENTER POSITION		ELECTRICALLY DISABLE AND MECHANICALLY DECOUPLE AFFECTED UNIT AND LOCK AFFECTED WHEELS IN STRAIGHT AHEAD POSITION.	MECHANICAL DECOUPLING AND STEERING LOCKING ARE IRREVERSIBLE FOR THE FRONT WHEELS.			
	31-63	BOTH STEERING UNITS DRIVE HARDOVER CONTRARY TO STEERING COMMAND OR FAIL TO RESPOND TO HAND CONTROLLER		ELECTRICALLY DISABLE, DECOUPLE, AND LOCK STEERING. CREW ASSESS DIRECTIONAL CONTROL USING LEFT/RIGHT DRIVE POWER TO DETERMINE TRAVERSE LIMITS.				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	LRV MOBILITY	31-5	Tape 41.6

# NASA - Manned Spacecraft Center

## MISSION RULES

### SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	31-64	DELETED						
	31-65	<p>TRACTION DRIVE MOTOR TEMP EXCEEDS 400°F OR PREDICTED TO EXCEED 450°F</p> <p>A. MOTOR IS NOT NEEDED TO MAINTAIN LRV MOBILITY</p> <p>B. MOTOR IS REQUIRED TO MAINTAIN ACCEPTABLE LRV MOBILITY</p>		<p>A. REMOVE MOTOR FROM SERVICE ELECTRICALLY. DECOUPLE MECHANICALLY AT NEXT STOP.</p> <p>B. MOTOR WILL BE KEPT IN SERVICE. TRAVERSE WILL BE ADJUSTED TO BE WITHIN WALKING ENVELOPE BEFORE TDS REACHES 450°F.</p>	<p>A. MOTOR IS REUSABLE AFTER COOLDOWN TO BELOW 400 DEG F. DUST REMOVAL MAY HELP COOLDOWN.</p> <p>V. ATTEMPT MOTOR COOLDOWN WHILE IN USE BY:</p> <ol style="list-style-type: none"> <li>1. DRIVING AT LEAST 4 KM/HR</li> <li>2. AVOIDING PROLONGED UPSLOPES</li> <li>3. BRUSHING ACCUMULATED DUST</li> </ol>			
	31-66	INSUFFICIENT POWER TO COMPLETE THE NOMINAL MISSION		<p>TAKE ACTION IN THE FOLLOWING ORDER AS REQUIRED:</p> <ol style="list-style-type: none"> <li>1. REMOVE THE LCRU FROM LRV POWER</li> <li>2. CURTAIL THE TRAVERSE TO WITHIN THE LRV POWER AVAILABLE</li> </ol>				
	31-67	<p>BRAKE WILL NOT RELEASE ON ONE WHEEL</p> <p>A. TRACTION DRIVE IS NOT REQUIRED FOR LRV MOBILITY</p> <p>B. TRACTION DRIVE IS REQUIRED FOR LRV MOBILITY</p>		<p>A. REMOVE POWER AND DECOUPLE WHEEL BEFORE CONTINUING MISSION.</p> <p>B. ATTEMPT TO FREE BRAKE BY BACKING/FORWARD MOTION, LEFT AND RIGHT STEERING COMMANDS, AND INDUCED SHOCKS AND VIBRATION. IF ALL FAILS, USE TRACTION DRIVE TO ACHIEVE LRV MOBILITY.</p>	<p>A. IT WOULD BE WORTH TIME TO CHECK THE WHEEL AFTER EACH STOP AS WORKING VIBRATION AND SHOCK MAY FREE MECHANISM.</p> <p>B. IT IS DUBIOUS IF TRACTION DRIVE WILL OVERCOME BRAKE, BUT ALL EFFORTS SHOULD BE EXPENDED BEFORE ABANDONING LRV.</p>			
	31-68	ABNORMAL AMPERE UNBALANCE BETWEEN BATTERY 1 AND BATTERY 2		REDISTRIBUTE LOADS TO MAINTAIN BATTERY REDUNDANCY. IF A DEFINITE MOTOR SHORT EXISTS (LOSS OF POWER OUTPUT OF TRACTION DRIVE), SHUT DOWN TRACTION DRIVE AND DECOUPLE AT NEXT STOP IF EXCESSIVE MECHANICAL DRAG IS SUSPECTED.				
	31-69	RESERVED						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	LRV ELECTRICAL	31-6	Tape 46.8

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MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	31-70	TRACTION DRIVE MOTOR POWER CIRCUITRY: A. FAILS ON  B. FAILS OFF		A. REMOVE POWER FROM AFFECTED TRACTION DRIVE. USE AS NECESSARY TO ACHIEVE ACCEPTABLE MOBILITY.  B. REMOVE POWER FROM AFFECTED TRACTION DRIVE	A. DRIVE POWER CB WILL POP IF FAILURE OCCURS WHILE BRAKE IS SET. CURRENT LIMITING IS BYPASSED.  B. NO "JACKRABBIT" MODE CAPABILITY WITH AFFECTED TRACTION DRIVE.			
	31-71	TRACTION DRIVE MOTOR CONTROL CIRCUITRY:  A. FAILS ON  B. FAILS OFF   RULE NUMBERS 31-72 THROUGH 31-100 ARE RESERVED.		A. USE AFFECTED TRACTION DRIVE AS DESIRED TO ACHIEVE MAX MOBILITY. POWER DOWN IF MOTOR IS UNMANAGEABLE AND FOR STOPS.  B. POWER DOWN AFFECTED TRACTION DRIVE. DECOUPLE IF EXCESSIVE WHEEL DRAG IS SUSPECTED.	A. USE DRIVE POWER SWITCH TO TURN AFFECTED MOTOR ON OR OFF.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	LRV DRIVE	31-7	Tape 41.8

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MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	ITEM	<u>SURFACE EXPLORATION SYSTEMS</u>						
31-101		<p>THE FILM-REMAINING STATUS FOR 70-MM FILM WILL BE TRACKED VIA PERIODIC CREW READ-OUTS TO ENSURE RETENTION OF ADEQUATE FILM FOR TASKS REMAINING ON THE EVA. FOR FILM-LIMITED SITUATIONS, PHOTO DOCUMENTATION WILL BE REDUCED IN THE FOLLOWING SEQUENTIAL STEPS:</p>						
		<ul style="list-style-type: none"> <li>A. ELIMINATE HIGHLY DESIRABLE PHOTOGRAPHY BEGINNING WITH LOWEST PRIORITY TASKS.</li> <li>B. ELIMINATE MANDATORY PHOTOGRAPHY WHERE TV COVERAGE CAN ADEQUATELY FULFILL THE PHOTO DOCUMENTATION REQUIREMENT.</li> <li>C. ELIMINATE MANDATORY PHOTOGRAPHY BEGINNING WITH LOWEST PRIORITY TASK.</li> </ul>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	SURFACE EXPLOR SYS	31-8	Tape 56.2

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MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				<u>TRAVERSE GRAVIMETER</u>				
	31-102	TGE MEASUREMENT MADE WHILE MOUNTED TO THE LRV INDICATES A PHASE LOCKED LOOP RATE ALARM		THE MEASUREMENT WILL BE REPEATED WITH THE TGE PLACED ON THE LUNAR SURFACE. ALL FUTURE MEASUREMENTS WILL BE MADE WITH THE TGE PLACED ON THE LUNAR SURFACE.	A PHASE LOCKED LOOP RATE ALARM IS INDICATED BY THE THREE MOST SIGNIFICANT DIGITS OF THE DISPLAY BEING ZERO.			
	31-103	TGE MEASUREMENT MADE WHILE PLACED ON LUNAR SURFACE INDICATES A PHASE LOCKED LOOP RATE ALARM		PHASE LOCK LOOP BYPASS MODE WILL BE USED TO REPEAT THE MEASUREMENT AND FOR ALL FUTURE MEASUREMENTS.	<ol style="list-style-type: none"> <li>1. PHASE LOCKED LOOP RATE ALARM IS INDICATED BY THE THREE MOST SIGNIFICANT DIGITS OF THE DISPLAY BEING ZERO.</li> <li>2. PHASE LOCKED LOOP BYPASS MODE IS INITIATED BY DEPRESSING BOTH "GRAY" AND "READ" SWITCHES SIMULTANEOUSLY.</li> <li>3. ALL MEASUREMENTS IN PHASE LOCKED LOOP BYPASS MODE HAVE A ZERO IN THE MOST SIGNIFICANT DIGIT OF THE DISPLAY.</li> </ol>			
	31-104	INTERMEDIATE OVEN HOT ALARM IS EXPERIENCED PRIOR TO DEPARTURE ON EVA-1.		PLACE TGE IN LM SHADE WITH RADIATOR COVER OPENED PRIOR TO DEPARTING ON EVA TRAVERSE.	<ol style="list-style-type: none"> <li>1. INTERMEDIATE OVEN HOT ALARM IS INDICATED BY A 6 OR 7 IN THE EIGHTH MOST SIGNIFICANT DIGIT OF THE DISPLAY.</li> <li>2. TGE WILL BE USED ON EVA'S II AND III.</li> </ol>			
	31-105	PRECISION OVEN TEMP REACHES MAXIMUM POSITIVE DEVIATION		<p>NO FURTHER MEASUREMENTS WILL BE TAKEN DURING THE REMAINDER OF THE CURRENT TRAVERSE.</p> <p>TGE WILL BE PLACED IN THE LM SHADOW WITH THE RADIATOR SURFACE EXPOSED AT THE EARLIEST CONVENIENCE.</p>	MAXIMUM POSITIVE DEVIATION IS INDICATED BY AN ODD NUMBER IN THE EIGHTH MOST SIGNIFICANT DIGIT OF THE DISPLAY AND A "7" IN THE NINTH (LEAST) SIGNIFICANT DIGIT.			
	31-106	RESERVED						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	SURFACE EXPLOR SYS	31-9	Tape 66.1

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MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	31-107	TGE PHASE LOCK LOOP FAILS TO ACQUIRE LOCK DURING A NORMAL GRAVITY MEASUREMENT		PHASE LOCK LOOP BYPASS MODE WILL BE USED TO REPEAT THE MEASUREMENT AND FOR ALL FUTURE MEASUREMENTS	<ol style="list-style-type: none"> <li>1. FAILURE OF PHASE LOCK LOOP TO ACQUIRE LOCK IS INDICATED BY A "9" IN THE MOST SIGNIFICANT DIGIT OF THE DISPLAY.</li> <li>2. PHASE LOCKED LOOP BYPASS MODE IS INITIATED BY DEPRESSING BOTH "GRAV" AND "READ" SWITCHES SIMULTANEOUSLY.</li> <li>3. ALL MEASUREMENTS MADE IN THE PHASE LOCKED LOOP BYPASS MODE HAVE A ZERO IN THE MOST SIGNIFICANT DIGIT OF THE DISPLAY.</li> </ol>			
	31-108	TGE IS OPERATED IN PHASE LOCKED LOOP BYPASS MODE.		TGE WILL BE PLACED ON LUNAR SURFACE FOR ALL MEASUREMENTS TAKEN IN THE PLL BYPASS MODE.	PLL BYPASS MODE HAS NO FILTERING REQUIRED FOR LRV MOUNTED MEASUREMENTS.			
	31-109	TGE MEASUREMENT IN PHASE LOCKED LOOP BYPASS MODE INDICATES ZEROS IN THE SEVEN MOST SIGNIFICANT DIGITS OF THE DISPLAY		ABANDON THE TRAVERSE GRAVIMETER EXPERIMENT	LOSS OF VIBRATING STRING SIGNAL ACCELEROMETER.			
	31-110	BIAS MEASUREMENT LIGHT FAILS TO EXTINGUISH AFTER 5 MINUTES OF MEASUREMENT TIME.		ABANDON TRAVERSE GRAVIMETER EXPERIMENT	LOSS OF VIBRATING STRING ACCELEROMETER OUTPUT.			
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	SURFACE EXPLOR SYS	31-10	Tape 66.2

NASA - Manned Spacecraft Center

MISSION RULES

SECTION 31 - LUNAR SURFACE OPERATIONS - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
				SURFACE ELECTRICAL PROPERTIES				
	31-111	SEP RECEIVER TEMP AT INITIAL DEPLOYMENT IS > <u>TBD</u> ° F		OPEN RADIATOR COVERS 100% DURING EVA 1.	1. SEP IS NOT USED DURING EVA 1. 2. COVERS NORMALLY REMAIN CLOSED DURING EVA 1.			
	31-112	SEP RECEIVER TEMP PRIOR TO A TRAVERSE IS: A. > <u>TBD</u> ° F B. < 20° F		A. OPEN RADIATOR COVERS <u>100%</u> DURING THE EVA B. CLOSE RADIATOR COVERS DURING THE EVA  PLACE THE RECEIVER IN STBY MODE PRIOR TO THE TRAVERSE.				
	31-113	SEP RADIATORS ARE EXPOSED		A. THE RADIATOR SURFACES WILL BE DUSTED AFTER OPENING THE COVERS AT THE END OF EACH TRAVERSE B. THE RADIATOR SURFACES WILL BE DUSTED AT THE BEGINNING OF EACH STOP DURING WHICH THE COVERS WILL BE OPEN.				
	31-114	RESERVED						
	31-115	BETWEEN EVA SEP CONFIGURATION		RADIATOR COVERS WILL NORMALLY BE OPENED <u>20%</u> FOR BETWEEN EVA COUNTDOWN.  THIS WILL BE ADJUSTED TO 80% OR 100% DEPENDING ON REAL-TIME THERMAL CONDITIONS AT THE END OF THE EVA.				
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	LUNAR SURFACE OPS	SURFACE EXPLOR SYS	31-11	Tape 66.3

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MISSION RULES

SECTION 32 - ALSEP

R	ITEM							
		<u>GENERAL</u>						
		THE FOLLOWING MISSION RULES APPLY TO FLIGHT CREW INVOLVEMENT WITH THE APOLLO LUNAR SURFACE EXPERIMENT PACKAGE (ALSEP) WHILE THE CREW IS ON THE LUNAR SURFACE. THESE RULES ARE EXCEPTED FROM THE EMRD FOR APOLLO 17, AND MISSING LETTERS ON RULES OR MISSING RULE NUMBERS PERTAINING TO GUIDELINES OR RULINGS WILL BE FOUND IN THAT DOCUMENT.						
		<u>ALSEP OPERATIONAL GUIDELINES</u>						
	32-1	<u>GENERAL</u>						
		A. THESE ALSEP GENERAL OPERATIONAL GUIDELINES ARE BASED ON OBJECTIVES IN THE FOLLOWING PRIORITIES:						
		<ul style="list-style-type: none"> <li>1. HFE</li> <li>2. LSF</li> <li>3. LSG</li> <li>4. LMS</li> <li>5. LEAM</li> </ul>						
		<u>NOTE</u>						
		RIPPLE-OFF SEQUENCE IS:						
		<ul style="list-style-type: none"> <li>1. PDR 1 (7 W)</li> <li>2. PDR 2 (14 W)</li> <li>3. LMS</li> <li>4. LEAM</li> <li>5. HFE</li> </ul>						
		B.	REFERENCE EMRD FOR APOLLO 17					
		THROUGH } H.						
		I. THE ALSEP SHORTING PLUG SWITCH WILL BE ACTIVATED ASAP AFTER CENTRAL STATION DEPLOYMENT.						
		J. IF THE GROUND IS UNABLE TO OBTAIN DOWNLINK, THE GROUND WILL REQUEST THE ASTRONAUT TO ROTATE THE RESET POWER SWITCH CW AND THEN CCW.						
		K. REFERENCE APOLLO 17 EMRD						
		L. A SINGLE COMMAND CARRIER WILL BE MAINTAINED ON AND IN THE SAFED CONFIGURATION EXCEPT TO SEND COMMANDS AND REMOTE SITE HANDOVERS FROM DEPLOYMENT INITIATION UNTIL AFTER LM LIFT-OFF TO PROVIDE ADDITIONAL PROTECTION AGAINST THE GENERATION OF SPURIOUS COMMANDS.						
		M. THE HFE BORE HOLES WILL HAVE PRIORITY OVER THE DRILL CORE STEM. THE HFE BORE HOLES WILL BE ATTEMPTED FIRST. IF PROBLEMS ARE ENCOUNTERED, EFFORTS ON BORE HOLES WILL BE TERMINATED AFTER A TOTAL OF 20 MINUTES ACCUMULATED DRILL ON TIME.						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	ALSEP	GENERAL	32-1	
								Tape 26.4

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## MISSION RULES

### SECTION 32 - ALSEP - CONTINUED

R	ITEM							
32-1 (CONT)	<p>N. IF A HARD OBJECT IS ENCOUNTERED WHICH REDUCES DRILL RATE TO LESS THAN 5 INCHES PER MINUTE ON EITHER HFE PROBE HOLE, THE FOLLOWING WILL BE ACCOMPLISHED:</p> <ol style="list-style-type: none"> <li>1. IF THE SECOND STEM SECTION IS NOT ATTACHED, WITHDRAW AND START AT A NEW LOCATION FOR A MAXIMUM OF TWO WITHDRAWALS.</li> <li>2. IF THE SECOND STEM SECTION IS ATTACHED, CONTINUE UNTIL 10 MINUTES OF POWER ON TIME FOR DRILL STRING HAS ELAPSED.</li> </ol> <p>O. REFERENCE APOLLO 17 EMRD</p> <p>P. IF THE CREW MUST RETURN TO THE LM PRIOR TO COMPLETE ALSEP DEPLOYMENT, THE SHORTING PLUG SWITCH WILL BE ACTIVATED "ON" IF THE ANTENNA IS EMPLACED. IF THE ANTENNA IS NOT EMPLACED, THIS SWITCH WILL NOT BE ACTIVATED (PICK UP HERE ON EVA 2)</p> <p>Q. THROUGH R. REFERENCE APOLLO 17 EMRD</p> <p>S. FOR ANY MALFUNCTION DURING A SURFACE TASK, A MAXIMUM OF 10 MIN WILL BE SPENT ON THE CONTINGENCY PROCEDURE BEFORE THE TASK IS ABANDONED, WITH THE FOLLOWING EXCEPTIONS:</p> <ol style="list-style-type: none"> <li>1. RTG FUELING - UP TO 20 MIN WILL BE ALLOWED IN EXERCISING RTG FUELING CONTINGENCY PROCEDURES.</li> <li>2. ALSEP PACKAGE 1 TO PACKAGE 2 CABLE CONNECTIONS - UP TO 20 MIN WILL BE ALLOWED FOR MAKING THE CABLE CONNECTION.</li> <li>3. ALSEP ANTENNA - UP TO 30 MIN WILL BE ALLOWED FOR ANTENNA ERECTION AND ALIGNMENT.</li> <li>4. ALSEP DEPLOYMENT MAY BE CONTINUED ON A LATER EVA IF ADDITIONAL TIME TO SPEND ON CONTINGENCY PROCEDURES IS REQUIRED TO ATTAIN AN OPERATIONAL ALSEP.</li> </ol> <p>T. FOR EVA TERMINATION OR OTHER INTERRUPTIONS DURING ALSEP DEPLOYMENT, THE FOLLOWING DEPLOYMENT INTERRUPTION POINTS WILL BE OBSERVED IF PERMITTED BY CREW SAFETY CONSIDERATION:</p> <ol style="list-style-type: none"> <li>1. REMOVE ALSEP PACKAGES 1 AND 2. CLOSE SEQ. BAY DOOR. REPLACE ALSEP PACKAGES WITH HANDLES UP AND WITH EXPERIMENTS FACING THE SUN WITHIN <math>\pm 15^\circ</math>.</li> <li>2. TILT FUEL CASK (DOME NOT REMOVED).</li> <li>3. TILT FUEL CASK. REMOVE DOME. DO NOT DEFUEL.</li> <li>4. FUEL RTG. THEN CARRY ALSEP TO DEPLOYMENT SITE. REMOVE ALL COMPONENTS FROM PACKAGE 2. CARRY PACKAGE 1 TO EMPLACEMENT SITE. DO NOT CONNECT RTG CABLE TO CS UNLESS SUFFICIENT TIME IS AVAILABLE TO ERECT THE CS SUNSHIELD.</li> <li>5. CONNECT HFE CABLE TO CS. REMOVE PSE, ASE, AND LSM FROM SUBPACKAGE 1. ALIGN CS AND RAISE SUNSHIELD. MOUNT ANTENNA MAST, GIMBAL, AND ANTENNA. LEVEL AND ALIGN ANTENNA, DEPRESS SHORTING PLUG ON WAY BACK TO LM.</li> <li>6. DEPLOY ALSEP EXPERIMENTS AND COMPLETE TASKS. A HOLD POINT EXISTS AFTER EACH TASK IS COMPLETED. DEPRESS SHORTING PLUG SWITCH AND ROTATE ASTRO SWITCH 1 CLOCKWISE ON WAY BACK TO LM (SEE CONTINGENCY PROCEDURES FOR HOLD POINTS).</li> </ol>							
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	ALSEP	GENERAL	32-2	Tape 45.2



NASA - Manned Spacecraft Center

MISSION RULES

SECTION 32 - ALSEP - CONCLUDED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS			
	32-81	<p>UNABLE TO DRILL NORMAL HFE EMBLACEMENT HOLES</p> <p>A. IF EITHER HOLE IS LESS THAN 24 INCHES DEEP AND DRILL IS INOPERABLE</p> <p>B. NEITHER HOLE IS 24 INCHES DEEP AND DRILL IS STILL OPERABLE</p> <p>C. IF HOLE IS NOT NOMINAL DEPTH</p>		<p>A.1. HAND-AUGER BORE STEMS INTO SUBSURFACE AT LEAST 40 INCHES</p> <p>2. IF UNSUCCESSFUL INSERT PROBE INTO HOLE MADE BY A DOUBLE CORE TUBE. FILL HOLE AROUND PROBE.</p> <p>3. IF UNABLE TO OBTAIN DEPTH &gt;24 INCHES, DIG TRENCH APPROX. 4 FT LONG, SLOPING FROM 1 INCH DEEP AT ONE END TO APPROX. 18 INCHES DEEP AT OTHER END. PLACE PROBE IN TRENCH WITH CABLE AT SHALLOW END. COVER PROBE AND FIRST 6 FT OF CABLE WITH AS MUCH SOIL AS POSSIBLE.</p> <p>B. DRILL DEEP CORE AT PROBE NO. 1 LOCATION AND INSERT PROBE IN HOLE THROUGH TREADLE, AND CAVE SOIL IN AROUND PROBE.</p> <p>C. PLACE PROBE IN HOLE AS FAR AS IT WILL GO. EMBLACE LOWER RADIATION SHIELD ON THE TOP OF THE PROBE REGARDLESS OF PROBE DEPTH.</p>	<p>B. USE TREADLE AND EXTRACTOR TO HOLD SOIL IN PLACE. MOVE TREADLE AT LEAST 10 FEET DOWN THE CABLE TOWARD THE ELECTRONICS.</p>			
	32-82	HAVE CHOICE OF DRILLING SECOND HFE HOLE OR CORE SAMPLE HOLE		DRILL SECOND HFE PROBE EMBLACEMENT HOLE.	HFE HAS PRIORITY OVER CORE SAMPLE.			
	32-83	DRILL RATE REDUCED TO LESS THAN 5 INCHES PER MINUTE		<p>A. IF LESS THAN TWO STEM SECTIONS ARE ATTACHED TO THE POWER HEAD, WITHDRAW AND START AT NEW LOCATION FOR MAXIMUM OF TWO WITHDRAWALS.</p> <p>B. IF TWO OR MORE STEM SECTIONS ARE ATTACHED TO THE POWER HEAD, CONTINUE UNTIL 10 MINUTES OF POWER ON TIME FOR THE DRILL STRING HAS ELAPSED.</p>				
	32-84 THRU 32-110	REFERENCE APOLLO 17 EMRD						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	ALSEP	SPECIFIC	32-4	Tape 47.7

SECTION 33 IS DELETED.  
REFERENCE LUNAR ORBIT  
EXPERIMENT MISSION  
RULES IN SECTION 3 OF  
THIS DOCUMENT.

THIS SECTION WAS DELETED  
TO ELIMINATE DUPLICATION  
OF RULES IN SECTION 3  
OF THIS DOCUMENT.

~~33 LUNAR ORBIT  
EXPERIMENTS~~













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## MISSION RULES

### APPENDIX B - DISTRIBUTION LIST

R	ITEM	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 80%;">DISTRIBUTION LIST</div>						
		<p><u>DIRECTOR</u></p> <p>AA/KRAFT, C. C., JR.                      AB/SJOBERG, S. A.                      AC/ABBEY, G.</p> <p><u>DIRECTOR OF FLIGHT OPERATIONS</u></p> <p>FA/TINDALL, H. W.                      ROSE, R. G.</p> <p><u>FLIGHT CONTROL DIVISION</u></p> <p>FC/KRANZ, E. F.                      GRIFFIN, G. D.                      FRANK, M. P.                      ROACH, J. W.                      BROOKS, M. F.                      FC2/HARLAN, C. S.                      FC3/LOE, T. R. (43)                      FC3/BLAIR, L. W. (2)                      FC4/HANNIGAN, J. E. (25)                      FC5/BOSTICK, J. C. (16)                      FC8/SHELLEY, C. B. (6)                      FC6/HOOVER, R. (24)                      FC9/SAULTZ, J. E. (18)                      P-MO-F/HAMNER, R. S. (20)                      FC7/STULLKEN, D. E. (27) ALSO, SEND EXTRA COPIES TO STULLKEN/FC7</p> <p><u>FLIGHT SUPPORT DIVISION</u></p> <p>FS/STOKES, J. D.                      FS4/BULLOCK, E. C. (18)                      FS6/RANDALL, E. L.                      FS6/GARMAN, J. R.                      FS7/WATKINS, J. D.</p> <p><u>MISSION PLANNING AND ANALYSIS DIVISION</u></p> <p>FM/MAYER, J. P. (2)                      FM2/BENNETT, F. V. (6)                      FM3/BROWN, R. H.                      FM4/JENKINS, M. V.                      FM7/CASSETT, M. D.                      FM8/LINEBERRY, E. C.                      FM9/MCHENRY, E. N.                      FM13/GURLEY, J. R. (3)</p> <p><u>DIRECTOR OF FLIGHT CREW OPERATIONS</u></p> <p>CA/SLAYTON, D. K.                      CB/ASTRONAUT OFFICE (10)</p> <p><u>FLIGHT CREW INTEGRATION DIVISION</u></p> <p>CD4/KUEHNEL, H. A.                      CD2/FRANKLIN, G. C.</p> <p><u>CREW TRAINING AND SIMULATION DIVISION</u></p> <p>CET2/RUDD, C. D.                      WARD, T.                      CE2/FABER, S.                      CEK/THOMPSON, L. E. (16)</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	APPENDIX B- DISTR LIST		B-1	Tape 60.1

# NASA - Manned Spacecraft Center

## MISSION RULES

### APPENDIX B - DISTRIBUTION LIST - CONTINUED

R	ITEM							
		<p><u>CREW PROCEDURES DIVISION</u></p> <p>CG3/ZEDEKAR, R. G. (5)            CG4/KRAMER, P. (4)            CG5/HOLLOWAY, T. W. (8)</p> <p><u>DIRECTOR OF MEDICAL RESEARCH AND OPERATIONS</u></p> <p>DA/JOHNSTON, R. S.            DD/MEDICAL OPERATIONS (7)</p> <p><u>PUBLIC AFFAIRS OFFICE</u></p> <p>AP3/WARD, D. (3)</p> <p><u>APOLLO SPACECRAFT PROGRAM OFFICE</u></p> <p>PA/MORRIS, O. G.                LUNNEY, G. S.            PD/KUBICKI, R. L.            PD12/MISSION STAFF ENGINEER            PG/GOREE, J. F. (2)            PD12/KOHR, D.            PD4/SILVER, M. (25)            PD9/WILLIAMS, L.            PE/CORCORAN, D. M. (3)            PA23/TASH, H. L. (5)            PT/ARABIAN, D. D.            PT3/DATA LIBRARY (8)            KT/DOUGLAS, W. H.            NA/BLAND, W. M., JR.            PF/ (2)            PD12/SEGNA, D. (2)</p> <p><u>DIRECTOR OF ENGINEERING AND DEVELOPMENT</u></p> <p>EA22/BURT, R.            EB5/BURTZLOFF            EB3/MUNFORD                JOHNSON, G. W.            EC/SMYLIE, R. E.                HURT, P. F.            EC2/GIBSON, J. L.            EC3/SAMONSKI, F. H. (2)            EC4/HINNERS, A. H.            EC7/RADNOFSKY, M. I.            EC9/LUTZ, C. C.            EE13/IRWIN (9)            EF/GIESECKE, R. L.            EG2/COX, K. J.            EG7/HANAWAY, J.            EG8/WILSON, R. E.            EG/MIT/IL-LAWTON, T. M.            EP/FERGUSON, R. B. (3)            EP2/YODZIS, C. W. (4)            EP4/POHL, H. O. (3)            ES42/ROGERS, W. F. (2)            EX/REDD, B.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	APPENDIX B- DISTR LIST		B-2	Tape 60.3

# NASA - Manned Spacecraft Center

## MISSION RULES

APPENDIX B - DISTRIBUTION LIST - CONTINUED

R	ITEM								
		<p><u>FLIGHT SAFETY OFFICE</u></p> <p>SN/RICE, C. N. (3)</p> <p><u>RELIABILITY AND CERTIFICATION OFFICE</u></p> <p>NB2/WILLIAMS, H. L. (2) ND/JONES, J. A.</p> <p><u>DIRECTOR OF SCIENCE AND APPLICATIONS</u></p> <p>TA/CALIO, A. J. (3) TA/WRIGHT, R. A. (3) TD5/BALDWIN, R. (10)</p> <p><u>SKYLAB PROGRAM OFFICE</u></p> <p>KM/BISHOP, A. A.</p> <p><u>TRW HOUSTON</u></p> <p>TRW TECHNICAL INFORMATION CENTER, HOUSTON OPERATIONS (5) H2/2064-MITCHELL, R. A.</p> <p><u>NORTH AMERICAN ROCKWELL HOUSTON</u></p> <p>SWIM, R. (2)</p> <p><u>GODDARD SPACE FLIGHT CENTER</u></p> <p>KNOX, C. B. (9) CODE 821.1 MANNED FLIGHT OPERATIONS DIVISION, REQUIREMENTS SECTION</p> <p><u>JOHN F. KENNEDY SPACE CENTER NASA - MSOB</u></p> <p>AA-AVO/SMITH, A. G. (4) CEK/ASTRO OFFICE (6) LO/KAPYRAN, W. J. LO-PLN-2/KNIGHT, G. W. LV/GRUENE, H. LV-B/RIGELL, I. A. LV-OMO-1/NAGEL, C. G. LV-OMO-3/YOUMANS, R. E. LV-GDC/LEALMAN, R. E. LV-INS/EDWARDS, M. D. LS/WILLIAMS, J. J. LS-ENG-7/GASKINS, R. B. (4) LS-ENG-8/MARS, C. B. (4) TBC, VAB 2L1/ZYZAK, E. E. (2) NR, 3M1/FISCHER, G. R. (2) MDC, 3K1/SHAFFER, J. R. (2) IBM, 3N1/GROVIER, P. M. (2) TS/CLARK, R. L. (2) RS/MOORE, A. H. IN/SENDER, K. (3) SO/GORMAN, R. E. PSK/MORSE, A. E. KSC MISSION DIRECTOR'S OFFICE, R3121, MSO BLDG. GAC, M/S 300-6/WATSON, J. K. (6)</p> <p><u>MARSHALL SPACE FLIGHT CENTER</u></p> <p>MSFC/P-MO-MGR, MISSION OPERATIONS OFFICE (40)</p>							
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 17	FNL	9/1/72	APPENDIX B - DISTR LIST		B-3	Tape 21.6

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## MISSION RULES

APPENDIX B - DISTRIBUTION LIST - CONCLUDED

R	ITEM							
		<p><u>OFFICE MANNED SPACEFLIGHT</u></p> <p>M/MYERS, D.  MA/PETRONE, R.  MA/LEE, C. M.  MAO/LAND, E. W. (20)  TC/DRAPER, C. N. (5)  MAE/ALLMAN, J.</p> <p><u>DOD MSF SUPPORT OFFICE PAFB, FLA</u></p> <p>DDMS-M  DDMS-N/DEARMAN, J., MAJ.  ETOOP-2 PAFB FLA, 32925 (7)</p> <p><u>MIT INST. LABORATORIES CAMBRIDGE, MASS.</u></p> <p>NEVINS, J. (4)  COPPS, S. (2)  LARSON, R. (2)  FELLMAN, P. (3)</p> <p><u>GRUMMAN AIRCRAFT ENGINEERING CORP., BETHPAGE, NEW YORK</u></p> <p>PRATT, R. (35)</p> <p><u>NASA, DAYTONA BEACH OPER, P. O. BOX 2500, DAYTONA BEACH, FLA. 32015</u></p> <p>MA-2D/CAHALAN, P. F.</p> <p><u>GENERAL ELECTRIC, 1830 NASA BLVD, HOUSTON, TEXAS 77058</u></p> <p>GE/753/NELSON, G. C.</p> <p><u>BENDIX</u></p> <p>TDX/MILEY, R. R. (2)</p> <p><u>BOEING CORPORATION</u></p> <p>HA04/DATA MANAGEMENT (4)</p> <p><u>WEATHER</u></p> <p>SANDERSON, ALAN N.</p>						
		MISSION	REV	DATE	SECTION	GROUP	PAGE	
		APOLLO 17	FNL	9/1/72	APPENDIX B - DISTR LIST		B-4	Tape 21.7

# NASA - Manned Spacecraft Center

## MISSION RULES

### APPENDIX C - CHANGE CONTROL

R	ITEM													
		<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 100px;">CHANGE CONTROL</div>												
	1.0	<u>INTRODUCTION</u>												
	1.1	<p>PURPOSE</p> <p>THE PURPOSE OF THIS APPENDIX IS TO DELINEATE CHANGE CONTROL PROCEDURES FOR THE MISSION RULES. THIS WILL INSURE THE PROPER COORDINATION OF CHANGES, PROVIDE A RECORD OF PROPOSED CHANGES (INCLUDING THE RATIONALE FOR MAKING THEM), AND WILL PROVIDE A MEANS FOR PROMULGATING INDIVIDUAL RULE UPDATES BETWEEN REVISIONS (INTERIM CHANGES).</p>												
	1.2	<p>EFFECTIVITY</p> <p style="text-align: center;">SEPTEMBER 1, 1972</p>												
	2.0	<u>CHANGE PROCEDURES</u>												
	2.1	<p>SUBMISSION OF CHANGES</p> <p>PROPOSED CHANGES ARE SOLICITED FROM ANY INDIVIDUAL OR ORGANIZATION HAVING A VALID INPUT. CHANGES ORIGINATING OUTSIDE THE FLIGHT CONTROL TEAM WILL BE SUBMITTED DIRECTLY TO THE ASSISTANT FLIGHT DIRECTOR (AFD). CHANGES ORIGINATING WITHIN THE FLIGHT CONTROL TEAM WILL BE SUBMITTED TO THE AFD VIA THE PRIME MISSION OPERATIONS CONTROL ROOM (MOCR) POSITION CONCERNED.</p>												
	2.1.1	<p>FORMAT</p> <p>PERSONS DESIRING TO SUBMIT A PROPOSED CHANGE WILL COMPLETE ALL ITEMS ON THE FORM SHOWN IN FIGURE C-1 (FORM MUST BE TYPED). ADDITIONAL PAGES MAY BE USED IF THE SPACE PROVIDED IS NOT ADEQUATE. THE COMPLETED ORIGINAL FORM AND ONE COPY WILL THEN BE FORWARDED TO THE AFD.</p> <p>THE AFD WILL REVIEW THE FORM FOR COMPLETENESS AND PROPER MISSION RULE FORMAT, AND MAKE CORRECTIONS AS REQUIRED. THE ORIGINATOR WILL BE ADVISED OF ANY SUCH CHANGES.</p>												
	2.2	APPROVAL												
	2.2.1	<p>COORDINATION</p> <p>THE ORIGINATOR OF THE CHANGE MAY OBTAIN PRELIMINARY CONCURRENCES. THE AFD WILL, HOWEVER, OBTAIN FORMAL CONCURRENCES OR DISAPPROVALS (VERBALLY OR BY INITIATING) FROM THE NECESSARY PERSONNEL. VERBAL CONCURRENCES WILL BE INDICATED IN THE APPROPRIATE SIGNATURE BOX.</p>												
	2.2.2	<p>SIGNOFF/DISAPPROVAL</p> <p>UPON OBTAINING THE REQUIRED CONCURRENCES OR NEGATIVE COMMENTS, THE AFD WILL PRESENT THE PROPOSED CHANGE TO THE FLIGHT DIRECTOR FOR FINAL APPROVAL OR DISAPPROVAL. THE AFD MAY SIGN OFF OR DISAPPROVE PROPOSED CHANGES IN THE ABSENCE OF THE FLIGHT DIRECTOR.</p>												
	2.2.3	<p>DISAPPROVED CHANGES</p> <p>IF A CHANGE IS DISAPPROVED THE AFD WILL RETURN THE COPY TO THE ORIGINATOR. A COPY OF THE REQUESTED CHANGE WILL BE RETAINED FOR FUTURE REFERENCE.</p>												
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">MISSION</th> <th style="width: 10%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 25%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 15%;">PAGE</th> </tr> </thead> <tbody> <tr> <td>APOLLO 17</td> <td>FNL</td> <td>9/1/72</td> <td>APPENDIX C - CHANGE CONTROL</td> <td></td> <td>C-1</td> </tr> </tbody> </table>	MISSION	REV	DATE	SECTION	GROUP	PAGE	APOLLO 17	FNL	9/1/72	APPENDIX C - CHANGE CONTROL		C-1
MISSION	REV	DATE	SECTION	GROUP	PAGE									
APOLLO 17	FNL	9/1/72	APPENDIX C - CHANGE CONTROL		C-1									

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## MISSION RULES

### APPENDIX C - CHANGE CONTROL - CONCLUDED

R	ITEM																																																																
	<p>2.3 PUBLICATION AND DISTRIBUTION OF INTERIM CHANGES</p> <p style="text-align: center;">INTERIM CHANGES WILL BE DISTRIBUTED VIA AN ABBREVIATED DISTRIBUTION LIST CONSISTING OF THE MISSION CONTROL TEAM, PERTINENT NASA ORGANIZATIONS, AND THE APPROPRIATE VEHICLE CONTRACTOR(S).</p> <p>3.0 REVISIONS</p> <p>3.1 DEVELOPMENT</p> <p style="text-align: center;">THE AFD WILL COMPILE THE EFFECTIVE INTERIM CHANGES AND CORRECTIONS OF MINOR TYPOGRAPHICAL ERRORS INTO COMPLETE PAGE CHANGES TO THE BASIC DOCUMENT. ("PEN AND INK" CHANGES MAY BE USED TO CORRECT TYPOGRAPHICAL ERRORS IF THERE ARE NO OTHER CHANGES IN THE PAGE CONCERNED).</p> <p>3.2 APPROVAL</p> <p style="text-align: center;">SINCE ALL INTERIM CHANGES WILL HAVE RECEIVED PRIOR CONCURRENCES AND APPROVAL, ONLY THE FLIGHT DIRECTOR (OR THE AFD IN THE FLIGHT DIRECTOR'S ABSENCE) WILL BE REQUIRED TO APPROVE REVISIONS.</p> <p>3.3 PUBLICATION</p> <p>3.3.1 SCHEDULE</p> <p style="text-align: center;">REVISIONS WILL BE MADE ON AN "AS REQUIRED" BASIS.</p> <p>3.3.2 DISTRIBUTION</p> <p style="text-align: center;">REVISIONS WILL BE PRINTED AND DISTRIBUTED THROUGH THE NORMAL ADMINISTRATIVE CHANNELS.</p> <div style="text-align: center; margin-top: 20px;"> <small>NASA-MANNED SPACECRAFT CENTER MISSION RULE REQUEST/REVISION</small> </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 5%;">REV</th> <th style="width: 5%;">RULE</th> <th style="width: 30%;">CONDITION/MALFUNCTION</th> <th style="width: 5%;">PHASE</th> <th style="width: 30%;">RULING</th> <th style="width: 15%;">DATE</th> <th style="width: 20%;">NOTES/COMMENTS</th> </tr> </thead> <tbody> <tr> <td> </td> </tr> </tbody> </table> <p style="margin-top: 10px;">CHANGE RATIONALE:    <input type="checkbox"/> NEW TECHNICAL DATA    <input type="checkbox"/> CLARIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td colspan="3">ORIGINATOR: _____</td> <td colspan="3">APPROVED: _____</td> <td colspan="3">APPROVED: _____</td> </tr> <tr> <td colspan="3" style="text-align: center;"><small>NAME                      ORGANIZATION                      EXT</small></td> <td colspan="3" style="text-align: center;"><small>COGNIZANT BRANCH CHIEF</small></td> <td colspan="3" style="text-align: center;"><small>FLIGHT DIRECTOR</small></td> </tr> <tr> <td><small>AFD:</small> _____</td> <td><small>BSE:</small> _____</td> <td><small>FIDO:</small> _____</td> <td><small>AEROMED:</small> _____</td> <td><small>GUIDO:</small> _____</td> <td><small>CONTROL:</small> _____</td> <td><small>TELCOM:</small> _____</td> <td><small>EECOM:</small> _____</td> <td><small>OTHER:</small> _____</td> </tr> <tr> <td><small>CAPCOM:</small> _____</td> <td><small>D&amp;P:</small> _____</td> <td></td> <td></td> <td><small>RETRO:</small> _____</td> <td><small>GNC:</small> _____</td> <td></td> <td></td> <td></td> </tr> </table> <p style="font-size: small; margin-top: 5px;">MSC FORM 1555 (Rev. Dec 68)</p> <p style="text-align: center; margin-top: 20px;">FIGURE C-1. - MISSION RULE CHANGE REQUEST FORM</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <th style="width: 15%;">MISSION</th> <th style="width: 5%;">REV</th> <th style="width: 10%;">DATE</th> <th style="width: 20%;">SECTION</th> <th style="width: 15%;">GROUP</th> <th style="width: 10%;">PAGE</th> <th style="width: 25%;"></th> </tr> <tr> <td style="text-align: center;">APOLLO 17</td> <td style="text-align: center;">FNL</td> <td style="text-align: center;">9/1/72</td> <td style="text-align: center;">APPENDIX C - CHANGE CONTROL</td> <td></td> <td style="text-align: center;">C-2</td> <td style="text-align: right;">Tape 29.2</td> </tr> </table>	REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	DATE	NOTES/COMMENTS								ORIGINATOR: _____			APPROVED: _____			APPROVED: _____			<small>NAME                      ORGANIZATION                      EXT</small>			<small>COGNIZANT BRANCH CHIEF</small>			<small>FLIGHT DIRECTOR</small>			<small>AFD:</small> _____	<small>BSE:</small> _____	<small>FIDO:</small> _____	<small>AEROMED:</small> _____	<small>GUIDO:</small> _____	<small>CONTROL:</small> _____	<small>TELCOM:</small> _____	<small>EECOM:</small> _____	<small>OTHER:</small> _____	<small>CAPCOM:</small> _____	<small>D&amp;P:</small> _____			<small>RETRO:</small> _____	<small>GNC:</small> _____				MISSION	REV	DATE	SECTION	GROUP	PAGE		APOLLO 17	FNL	9/1/72	APPENDIX C - CHANGE CONTROL		C-2	Tape 29.2
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<small>NAME                      ORGANIZATION                      EXT</small>			<small>COGNIZANT BRANCH CHIEF</small>			<small>FLIGHT DIRECTOR</small>																																																											
<small>AFD:</small> _____	<small>BSE:</small> _____	<small>FIDO:</small> _____	<small>AEROMED:</small> _____	<small>GUIDO:</small> _____	<small>CONTROL:</small> _____	<small>TELCOM:</small> _____	<small>EECOM:</small> _____	<small>OTHER:</small> _____																																																									
<small>CAPCOM:</small> _____	<small>D&amp;P:</small> _____			<small>RETRO:</small> _____	<small>GNC:</small> _____																																																												
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APOLLO 17	FNL	9/1/72	APPENDIX C - CHANGE CONTROL		C-2	Tape 29.2																																																											